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Battelle Technical Review

IN THIS ISSUE : The Qualitative Approach to Scientific Information Problems

VIGNETTE

WILBUR A. SPRAKER, JR.

Many of the benefits from major segments of today's research seem out of reach for most consumer-oriented industries. Few of the studies being performed for defense organizations seem pertinent to those industries, because performance rather than economy must be the primary concern. "Yet much defense research is applicable to industry," says Wilbur A. Spraker, Jr. "In many instances, only a reversal of stress is needed to make it so—concentrating upon the cost factor. Such a shift in emphasis could benefit our entire economy. And with much of the basic knowledge already available, the financial strain upon industries need not be excessive."

At Battelle, Bill has been primarily engaged in research on fluid dynamics and heat transfer and with studies of aircraft-engine performance. He has been associated, at the Institute, with development of a unique compressor for an in-pile test loop for reactor fuel elements, and he made major contributions to the understanding of the fundamental aerodynamics of fan and blower performance. Another study involved heat-transfer characteristics of forced-convection boiling for use as a heat sink in supersonic aircraft. He also has conducted state-of-the-art studies in nuclear radiation effects and on the applications of high-temperature materials.

Bill has directed several performance-history studies of military aircraft engines and participated in studies to determine the instrumentation demands of such engines. Currently he is concerned with the investigation of the cavitation characteristics of pumps for use in pipelines and similar applications.

Before he joined the Battelle staff, Bill was employed in the aircraft industry. Following study at Purdue University, where he received bachelor's degrees in mechanical and aeronautical engineering and a master's degree in aeronautical engineering, he joined Pratt & Whitney. There he was concerned with the aerodynamic design of axial-flow and centrifugal compressors for gas-turbine engines. Later he joined Fairchild's aircraft nuclear propulsion study at Oak Ridge, eventually moving on to Convair's Fort Worth Division to work on problems in the same field. Reflecting his work in these fields and his more recent research interests, Bill holds membership in and contributes to the programs of the American Rocket Society and the Institute of Aeronautical Sciences.

Over the years, Bill has noted the difficulties of transposing research to application. Consequently he has been studying means for enabling researchers to pass on with the results of their studies the understanding necessary to utilize those studies to the fullest in design and production steps. Such passing on of know-how, he believes, may be as important as the research itself in determining the final value of many studies.

The Sprakers, Genevieve and Bill, share the joyful and troubled moments of their 11-year-old twin daughters, Elizabeth and Leslie. As relaxation, Bill indulges in non-curricular reading, listens to classical records, and fishes in Canada.

BATTELLE TECHNICAL REVIEW

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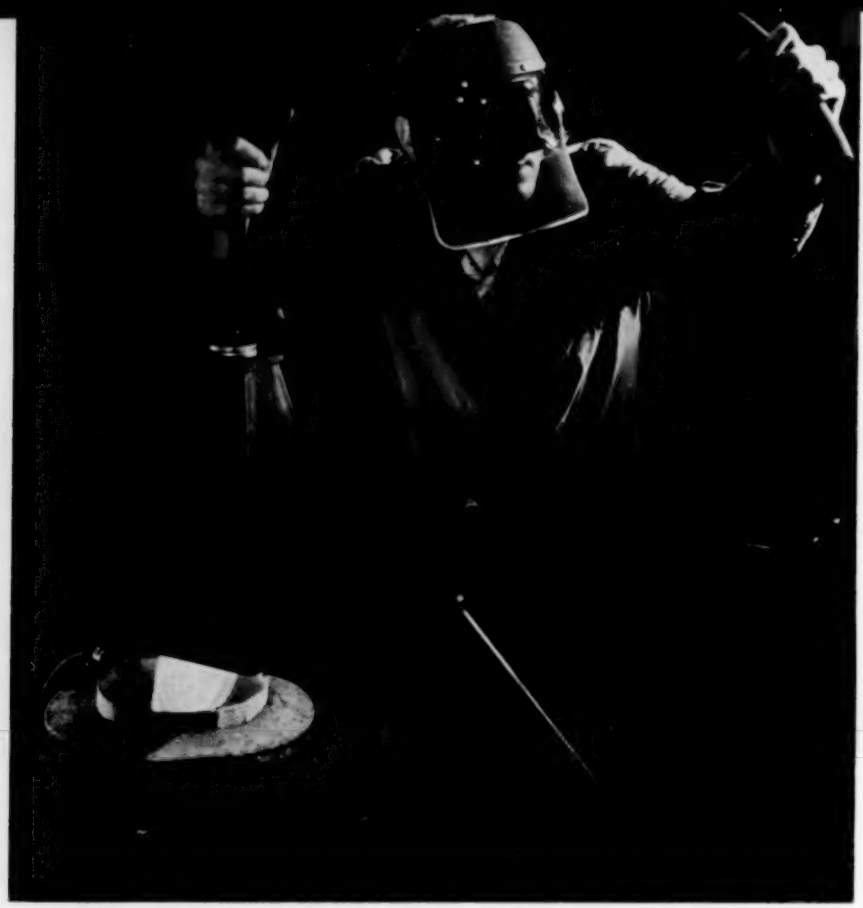


Collecting the smoke during a converter run. The weight of the smoke created during each run is important to the evaluation of each combination of parameters.

SMOKE FORMATION IN BESSEMER CONVERTERS

Heavy discharges of smoke are characteristic of the operation of the Bessemer converter. Producers of steel, long concerned about this source of air pollution, have asked Battelle to study feasible methods of reducing smoke formation. Collection of smoke may be technically possible, but is economically impracticable because of the vast amounts of gases discharged by converters. Other solutions, therefore, are being sought in research for the American Iron and Steel Institute.

One approach is to learn the causes of smoke formation. Controlling the varied conditions of blast-gas composition, metal temperature, and metal composition desired for the research would be trying and costly in conventional converters, and even taking smoke samples would be difficult. To conduct studies of the factors leading to smoke formation, therefore, George W. P. Rengstorff and his colleagues are utilizing a 2-pound laboratory-scale converter. In each run, they vary the metals, the temperature, crucible materials, and blowing gases. Once the converter has been brought to temperature (as determined by measurement with a thermocouple, photo, right), collections are made of all smoke formed and of samples of gases created in the converter. From analyses of the resulting data, the metallurgists hope to find clues to the causes of smoke formation.

Measuring the temperature of the small converter is important in smoke determination since temperature is a key factor in smoke formation. To the left of the thermocouple is the equipment for collecting gas samples.

Qualitative Approach to Scientific Information Problems

Experience has convinced the authors that the qualitative approach to scientific information problems can be highly effective. They discuss the elements essential to that approach and explain why it promises solutions to many of the problems facing information centers today.

by G. S. SIMPSON, JR. *and* J. W. MURDOCK

THE MAGNITUDE AND SERIOUSNESS of the scientific information problem have been described repeatedly over the last 15 years. Shortly after October 4, 1957, date of the launching of Sputnik I, however, the problem became a matter of national attention and concern. Millions of words were written to stun the reader with the huge numbers of scientific articles, books, and monographs being produced, to overwhelm him with predictions of the numbers of writings that would be produced over the next *x* years, to educate him with reports on surveys of the problem, or to indoctrinate him in the systems—usually employing either electronic or photoelectronic devices—which it was believed could solve the problem.

One of the most interesting documents, which elaborates the problem from a multitude of angles, is the record of "Hearing Before a Subcommittee of the Committee on Government Operations, United States Senate, Eighty-Fifth Congress, Second Session, on S. 3126, Part I, 1958". The 297-page document contains charts, tables, listings, statements, letters, exhibits, and proposals, all relating directly or indirectly to the scientific information problem. Experts from the United States testified before the Senate Subcommittee. Specialists representing universities, corporations, governmental organizations, and information specialty groups also testified to the seriousness of the situation as viewed in 1958.

While much of the public furor has died down, great numbers of articles in scientific and technical journals and numerous books are still being published, and an ever-increasing effort is being devoted to scientific and engineering research on the information problem. It is still being examined from many aspects—by scientists and research engineers whose corporations manufacture computing, data-processing, reproduction, and transmitting machines; by librarians, publishers, professional societies, linguists, and lexicographers; and by governmental organizations with such varied missions as the National Science Foundation and the Air Force.

The quick availability of information through the qualitative approach is apparent here. The user, or the information specialist working on his behalf, has access to carefully condensed information selected from the most valuable sources. The information is contained on the cards being used by the technologist; these have been drawn from the files in the background. Thus, the information seeker does not have to deal with overwhelming stacks of reports, periodicals, and other materials.

The flood of scientific information continues. And because of the quantities to be dealt with, the storage, retrieval, dissemination, and optimum use of the mass of material result in continuing problems for which solutions must be found.

It seems to the authors, however, that the important element of any information system is the user; if the user is not taken into consideration, the most efficient system may fail. Each user has his individual approach to information. This approach is qualitative in nature

since it relates to the user's concept of the form in which he believes he should get his information. The form can vary from a few articles to stacks of titles associated with the problem of interest, through volumes of abstracts, to a relatively few note cards containing condensed information that can be read without the necessity of opening a single volume. Recognizing the user's individuality as an element in the system is likely to modify views of how information systems might operate most effectively. Dealing with masses of materials is one problem. Making information available to the user in a useful form is another.

Much of what will be discussed in this article is based upon the experiences of Battelle engineers and scientists in organizing and operating information centers over most of the past decade. Concern with information problems began in 1951 when a large number of staff members were called upon to prepare state-of-the-art studies of varying types. Out of this experience came a realization that the quantitative aspects—storage, retrieval, and dissemination—are only part of the information problem. Perhaps more important are the nature of information, the quality of the written product of research, and an understanding of the user's approach to scientific information.

The Nature of Information

Experience at Battelle has shown that information, when put to use, naturally tends to group itself into (1) data and (2) interpretive presentations. A working hypothesis based upon this grouping has led to a much sharper definition of the nature of the scientific information problem and has provided fruitful results to the users of scientific information.

Nature of Data

Data are hypothesized to be number or letter patterns, radiations, drawings, or objects that have relatively little meaning until they are subjectively interpreted (reduced or analyzed) by a human being. At the same time, data are of a nature such that they may be interpreted differently by various individuals, though there is agreement on the definitions of the units being studied. Specific examples of types of data include: *Number or Letter Patterns* - 150,000 psi at 0.2 per cent offset, 500 mph, 60 cycles, or M 2.3; *Recordings* - photographs, photomicrographs, radiographs, etc.; *Objects* - ore samples, biological specimens, etc.; *Drawings* - maps, charts, graphs, etc.

Nature of Interpretive Presentations

Interpretive presentations, hypothesized to be the recorded subjective consideration of data or other information, or both, are the core of the information problem. Such presentations are usually in comprehensive narrative form wherein the authors record their own reactions to certain data, or to the inferences or opinions of others, based upon the same or different data. Typical examples of such presentations are analyses of number or letter patterns, radiations, and drawings; interpretations of the observations of other scientists or engineers; and purely theoretical discussions.

The real value of interpretive presentations is dependent upon two conditions—the reliability of their presenters (authors) and the astuteness of the receivers (readers). The value of the written works of an Einstein depends, first, upon the capability of the man to reach valid conclusions and to present them clearly, and, second, upon the ability of his readers to follow what the man has written and to see it in the light in which it was conceived. We are dealing here with qualitative rather than quantitative criteria.

Gustavus Simpson began his career as a metallurgical engineer, but has devoted much of his professional effort to the solution of scientific information problems. His association with Battelle began with the designing of a scientific information system. Later he served as consultant in the establishment of the Titanium Metallurgical Laboratory, now the Defense Metals Information Center. Simpson is currently devoting a portion of his time to problems of information analysis, the training of information specialists, and the guidance of information activities. He has responsibilities, also, in the technical coordination of multidisciplinary research conducted in the Institute.

John Murdock has been associated with the establishment and guidance of several information centers at Battelle. These have included the Defense Metals Information Center and the Radiation Effects Information Center. His other current responsibilities include a key role in a study that encompasses all information centers in the United States, duties as advisor on information matters to various governmental agencies, guidance of research on information problems, and direction of the Institute's library. Helping industries to benefit from information research already done by governmental agencies is a continuing interest of the author's.

The Impact of the Definitions of Data and Interpretive Presentations on the Information Problem

This pseudophilosophical commentary on data and interpretive presentations could be concluded to be just an exercise. However, its basic premises have been invaluable as a guide toward developing and operating information systems. Consideration of the nature of data leads to certain conclusions that have a significant bearing on the information problem. Most scientists and engineers will agree, for example, that a large fraction of the data obtained will not advance the level of scientific knowledge by being widely disseminated and stored, because man's ability to accumulate data far exceeds his capability to organize and interpret them. Often, more important to scientific purposes than their storage are the recording and disseminating of the description of the means by which data may be obtained, as a step in the solution of a particular problem. In any case, the machine storage and retrieval of data provide no insurmountable problems and thus are not the most difficult part of the scientific information problem.

Consideration of the nature of interpretive presentations suggests that the parameters of the scientific information problem usually discussed—quantities, storage, retrieval, and dissemination—may not be the causes of the problem, though they are unquestionably the result. More pertinent is the fact that the publication of scientific writings represents neither the most precise nor the most rapid mechanism for the transfer of scientific results and certainly not the only mechanism.

Much of the scientific literature adds little to our useable knowledge; it is redundant, ineffectively presented, or appears too late to be of value. Redundancy in the scientific information available in interpretive presentations is a serious problem, yet it is a condition that must be accepted. Creation of new knowledge calls for its rapid initial communication to the select few who can use it effectively. Later, as developments are relayed to the broader group that has a less critical need for the knowledge, additional and different types of communication are called for. Often authors of the early papers in a particular technical field present their findings in varied forms, which add nothing to their original statement; then, others interpret and restate the same points. The multiplicity of communications swells the stream of information, but adds little or nothing to our knowledge. Eliminating the valueless is a qualitative problem.

Ineffective presentation is another characteristic of many scientific publications. Poor writing, unimaginative organization, and the use of jargon known only to a very specialized fields make "reception" of such writings by any but the most select and perceptive reader very difficult. Making the best of such problems calls for the exercise of qualitative talents.

The value of many scientific communications depends upon their being quickly available. When handled through conventional channels, some information is certain to reach potential users too late; this suggests that scientific progress can be deterred by ineffective information systems. Fortunately, however, other than conventional methods of information dissemination are available. Thus, knowledge that is not obtainable quickly enough through published reports may often be obtained through visits, letters, and conferences among interested persons. What has been said about the special problems of presenting and receiving scientific information through published writings makes one point clear: The special relationship between the presenter and the receiver precludes the possibility of really effective standardized retrieval and dissemination systems.

The User and the Information Problem

What does the user want in the way of information? How frequently does he call upon the literature or other sources? How well does he understand the problems of getting the information he needs? Obviously, users are of different degrees of sophistication in dealing with the search for information. For our purposes, users may be divided roughly into two groups—the regular and the occasional user of information services.

The regular user is likely to be a scholar or other research scientist who must frequently use the outputs of research. Such a person seldom thinks of himself as having a "scientific information problem", although he may regret not having easier ways of obtaining information. Through experience he has developed his own particular method for keeping himself informed. He knows who is doing research of interest to him and where it is being done; indeed through correspondence, visits, or conferences, he usually has access to information and data before they are generally available.

It is the occasional user, rather, who believes he has an information problem. He usually identifies it as "getting both old and new information I need—fast—without wasting my time reading stuff I don't need". The occasional user is likely to have a regular flow of literature across his desk and a library close by, but he has no time, and seldom the inclination, to develop an effective method of obtaining information. Indeed, the evidence suggests that occasional users of information facilities pay less attention to the literature than is generally realized.

Nevertheless, to most engineers and scientists, sooner or later, comes the need for a thorough and serious investigation of the technical literature, both old and new. Whether the need grows out of an assignment to prepare a state-of-the-art report or an offer to initiate a research study, sometime every scientist and engineer faces the information problem. At that moment, identifying his needs qualitatively becomes a major concern. Will this user be satisfied with an overwhelming list of the books, papers, articles, and reports which he must first assemble and through which he must then wade? Or will he seek, rather, a source of carefully culled information that minimizes the amount of reading and analysis he must do and which will reduce the time he must spend in study?

The same questions may well be asked about another type of occasional user, the technical-scientific administrator. Frequently, the executive will require specific scientific information and data in a hurry in order to decide a course of action. His first thought is likely to be in the quantitative conventional terms of the information problem—quantity, retrieval, and dissemination. But he, like the scientist and engineer, will quickly come to the conclusion that there must be a better way than to pick his way through masses of materials. He, too, will seek the qualitative, and more effective, solution to his problem.

The Qualitative Approach

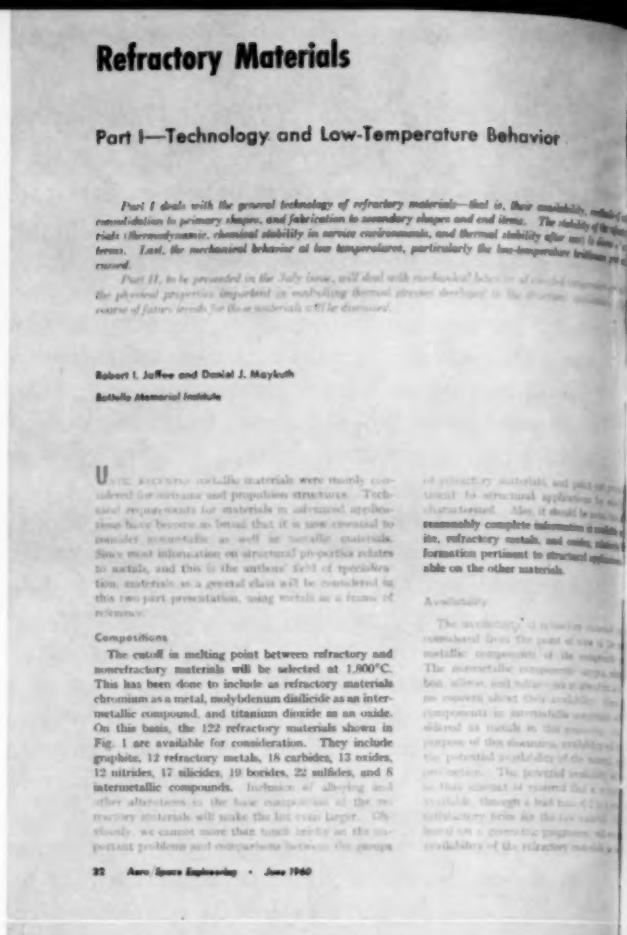
The development and use of the qualitative approach to information have led to the recognition of two requirements for its sucessful application:

1. To accomplish thorough state-of-the-art studies, the use of information sources other than the literature (e.g., trips, letters, discussions, conferences, etc.) is needed.

2. To maintain the qualitative approach, continued guidance by the scientist and research-engineer user is mandatory.

While the need for sources of information other than the literature has always been recognized by the scientist, it has not been equally recognized by the documentalist or the librarian. Or, if the latter has recognized the importance of such sources, he has been powerless to do much about it. Since such sources are largely a problem of personal contact, it has devolved primarily on the researcher himself to provide such nonliterature information. Providing the opportunity for obtaining such information should be the responsibility of any successful information facility.

The recognition of the need for qualitative guidance



Refractory Materials

Part I—Technology and Low-Temperature Behavior

Part I deals with the general technology of refractory materials—that is, their availability, methods of extraction, consolidation to primary shapes, and fabrication to secondary shapes and end items. The stability of the refractories (thermodynamic, chemical stability in service environments, and thermal stability after use) is discussed in general terms. Last, the mechanical behavior at low temperatures, particularly the low-temperature brittleness problem, is discussed.

Part II, to be presented in the July issue, will deal with mechanical behavior at elevated temperatures, the physical properties important in controlling thermal stresses developed in the structure, and the course of future trends for those materials will be discussed.

Robert I. Jaffee and Daniel J. Maykuth

Battelle Memorial Institute

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Availability

Compositions

The cutoff in melting point between refractory and nonrefractory materials will be selected at 1,800°C. This has been done to include as refractory materials chromium as a metal, molybdenum disilicide as an intermetallic compound, and titanium dioxide as an oxide. On this basis, the 122 refractory materials shown in Fig. 1 are available for consideration. They include graphite, 12 refractory metals, 18 carbides, 13 oxides, 12 nitrides, 17 silicides, 19 borides, 22 sulfides, and 8 intermetallic compounds.

reasonably complete information is available on graphite, refractory metals, and oxides, relatively little information pertinent to structural applications is available on the other materials.

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R. I. Jaffee, D. J. Maykuth, Battelle Memorial Institute
Refractory Materials, Part I-Technology and Low-Temperature Behavior
Aero/Space Engineering, Volume 19, No. 6, June 1960, pp 22 - 27 & 58

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"Selectivity" is the key to the mechanics of the qualitative approach to information. The page from a periodical (reproduced above through the courtesy of Aero/Space Engineering*) and the note prepared from it, illustrate how the information is condensed for the benefit of the user at Battelle. The blacker type on the printed page is that reproduced in the note. The chief steps in the selection of materials, as practiced in information centers at Battelle, include:*

1. A review of letters, trip reports, laboratory reports, manuscripts, and published literature to determine what materials are worthy of consideration for the information-center files;

2. A more critical review, by specialists in the pertinent disciplines, of the already tentatively proposed materials to assure the inclusion of only pertinent inputs into the system; and finally,

3. Extraction of the significant information by the specialists to eliminate unnecessary redundancy, followed by preparation, collating, and filing of the notes.

by scientists and research engineers is important in achieving optimum use of scientific information. Not only does the user accept a new responsibility with respect to scientific literature, but his own specialized knowledge also serves as a qualitative filter because of his more intimate knowledge of the vagaries of the information. This filtering function in itself largely overcomes many of the difficulties generally included in the scientific information problem. Research scientists and engineers so involved on a continuing, but part-time basis, become uniquely valuable members of a research staff.

The utilization of the qualitative approach has led to other ideas, which have proved to be extremely worth while in Battelle's information services. For example, it became obvious that the user cannot exercise a qualitative judgment on the basis of the title of a work; therefore, the use of extracts and abstracts became a standard operation. The user, no matter how intelligent, is limited in the number of areas in which he can make qualitative judgments effectively. To overcome this very natural limitation, the multiple review of accepted inputs was adopted.

Most scientists have an insatiable curiosity which often extends beyond the area of their immediate interest. Quite often information is found in a discipline normally not of interest to the researcher, which may throw a new light on his problems and enable him to advance faster than would otherwise be possible. Allowance must be made for such explorations by providing easy and stimulating access to other parts of the store of information.

The qualitative character of the relationship of the presenter and receiver of information makes undesirable the setting up of rigid relationships, such as subject classifications or codes and the like, to control information flow. Such relationships tend to channel the information and sometimes even to hide it because of the difficulty of providing adequate filing slots. At Battelle, information is filed by clue words underlined in the texts. These clue words tend to form natural patterns as the store of information grows, and they serve to provide rapid and effective guides to the recall of information.

The clue-word technique, however, is just the starting point of effective recall. Since the clue word is an underlined word in the text, which contains other underlined words as well (including authors, names of institutions, contract numbers, etc.), there is revealed a related pattern that sends the searcher to more information than may be obtained in the information filed under the first clue word. The searcher is thus led quickly to a broad spectrum of the field of interest. This insures that he is not only led quickly to information, but also that he is not likely to overlook information filed under synonyms or other related terms. It has been found, also, that it is very easy to tell when the resources of the file for the particular purpose of the search are exhausted.

Extensive experience with the qualitative approach to the scientific information problem has demonstrated that it is effective in meeting the need of users. More important, the qualitative approach has both simplified and speeded up the task of satisfying the needs of the occasional user, to whom information searches are frequently baffling and frustrating.

Summing up, it may be said that the qualitative approach recognizes: (1) the special nonquantitative relationship that exists between the presenter and the receiver of information; (2) the important difference between data and interpretive presentations that must be taken into account if we are to make real progress in the information problem; (3) the redundancy of most information sources; and (4) the need for the scientist and engineer user to provide the guidance and feedback that make for effective information services.

Conclusion

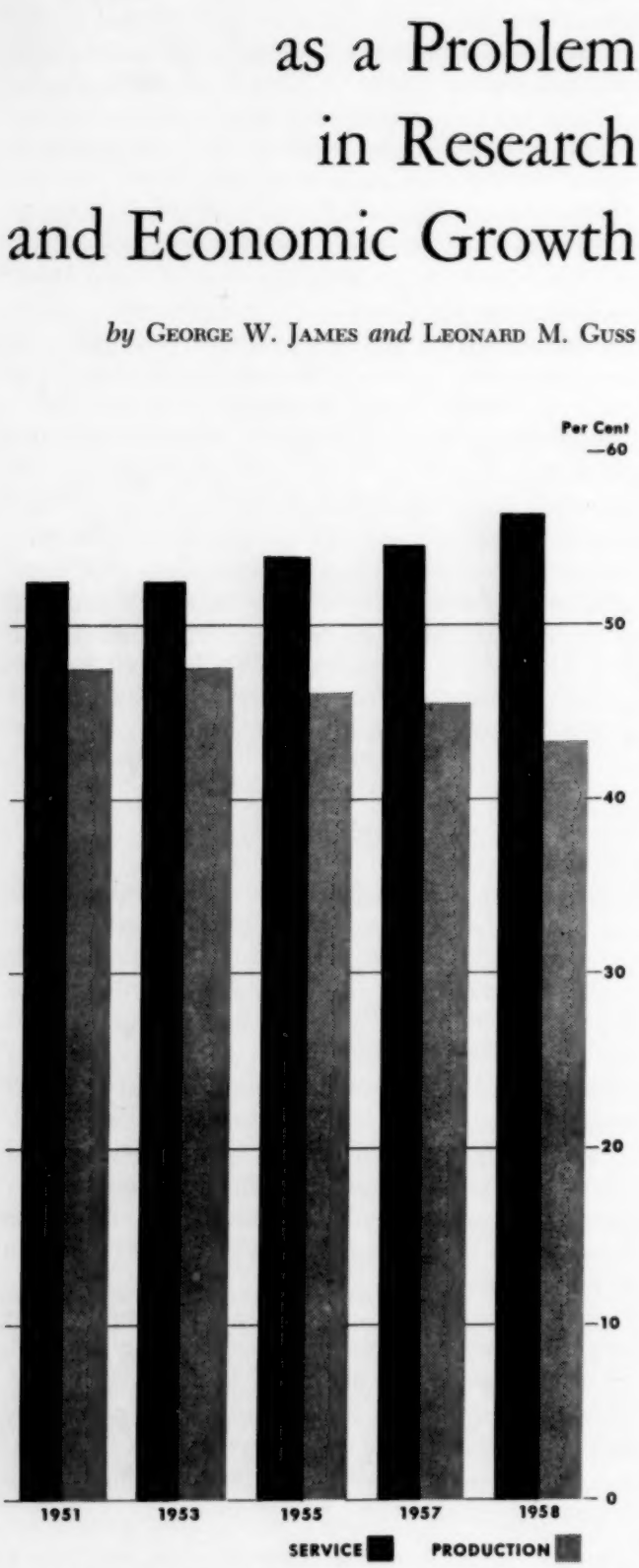
As science and technology advance, with the attendant need for informing an ever larger sector of the population, the stream of published materials must continue to rise. Most of this flood of words will inevitably be of no value to the serious worker. To load the researcher with guides to most of these publications only saddles him with the hopeless and defeating task of finding needles in haystacks. Just as the mineral dross must be removed so that useful metal can be produced, the meaningful and significant information must be separated from the millions of publications issuing from the presses and made easily available to those who need it.

Such separation, a qualitative task, requires the efforts of knowledgeable people cooperating in a well-planned system. Once organized, such a system benefits the serious seekers of information and spares them from fighting the rising tide of publications. Once they are abreast of their fields, only a minimum effort is required to enable them to stay there.

Services as a Problem in Research and Economic Growth

by GEORGE W. JAMES *and* LEONARD M. GUSS

The authors consider some of the dislocations in our service industries attributable to product research. They discuss the possible effects of service problems upon the future of product research and the continued expansion of U. S. ability to produce goods.



1. *The relative shares of the production and service industries to their total income. (Source: National Industrial Conference Board)*

FUTURE HISTORIANS WILL NOTE, as one of the chief characteristics of our time, the importance of research in our culture and the broad and steady stream of new products, new processes, and new materials which it has contributed to our economy. Granted, many of these are more or less minor variations and modifications of a lesser number of significant innovations, but, in total, the results of such research have been, and continue to be, impressive. What appears to be an almost unbroken record of success in many fields has led to an optimism—almost a faith—that continued research along similar or parallel lines will continue to be justified as the most effective means for solving both special and general economic and industrial problems. From this viewpoint, it is relatively easy to believe that what has not yet been done, problems that yet remain, will yield to similar approaches given enough time, concentration, and funds.

As befits a society primarily concerned with material goods and objective phenomena, this research has been directed almost entirely to product development of one kind or another. Material or process research cannot be excluded from this category since this, too, has as an end goal the creation of new or the modification of old products. To this goal have been directed, in recent years, sums exceeding $11 billion annually. There are excellent reasons for believing that still greater aggregates of funds, perhaps $25 billion by 1970, will be so expended. This total includes industrial and military applications, much of the industrial spending being actually financed by military budgets. But the product orientation overrides other consideration and there seems little doubt that success in product development has served as a criterion by which success, or lack of it, is judged, even in non-product fields.

Excluding military considerations, which are not germane to this article, these nonproduct fields are roughly equivalent to that group of economic activities generally known as "services". Services may be defined as economic activities which do not, of themselves, lead to physical end products, although they may well—and usually do—facilitate the manufacture of goods

by providing functions necessary to the creation of form utilities. Besides contributing to the effectiveness of the productive system, the services—including the personal services—help to create an environment that facilitates the production of goods. With the personal services are grouped other service functions such as transportation, distribution, financing, and other activities which do not usually result in form utility modifications; but, by creating other utilities of time, place, and possession, are a part of the body of transactions which make up the economic activity system.

Research and development has not been as productive in the services as in the product area. On this, at least, most are agreed. While top officials in industry and government have found it easy to point with pride to product research as indicative and predictive of a better way of life, many of these same persons have strongly criticized the nonproduct fields—services—for failure to keep pace with the progress made in the sister area. So widespread is this notion that it is almost part of the conventional wisdom to acknowledge that the services are "less productive" and hinder the growth of the economy as a whole. From this position, it is a short step to suggesting that all the power of technical R & D be applied to generating a solution in short order. Such calls to action have been the stock in trade of the luncheon speaker for some time, but with no especial impact on the relative "inefficiency" of the service industries.

In contrasting the application of technology to the product-development problems of government and industry, the problem of the lagging service industries appears at once intriguing and puzzling. Therefore, the authors decided to investigate the service industries as a group to see if R & D plans could be laid to bring to this recalcitrant field the inestimable benefits of product research. This approach fell apart shortly after it was initiated.

The Apparent Dilemma of Available Figures

The first step in the investigation of the "service" aspects of the economy was to compare the economic importance of service industries to production industries. As shown in Figure 1, a not-too-surprising, but important, fact arose: today, service industries represent a larger portion of industrial national income than production industries. This, for the most part, has been true since 1929 when the practice of national income accounting first began. More startling, perhaps, is the evidence that the service sector of industrial national income has been increasing steadily since 1951. Meanwhile, the manufacturing industry—the backbone of our "product" sector—dropped from 38.9 per cent of the total product and service income in 1951 to 34.8 per cent in 1958. These changes occurred in a period when product R & D expenditures rose explosively from $3 billion in 1953 to almost $10 billion by 1959.

Why had this happened? Several explanations come readily to mind:

1. The *relative share* to services is growing because no effective results have been obtained from cost-reduction efforts.
2. The *relative share* to product industries is decreasing because of their successful cost reduction programs, primarily through R & D.
3. The changes in relative shares are a natural phenomenon and are to be expected in a dynamic economy.

It seems apparent that where service costs are inflated unjustifiably, it is the ultimate consumer, or the economic system as a whole, which suffers. It is commonplace today to read of the more pronounced rise in service prices over prices of goods. Also, if figures could be obtained, it is highly probable they would show that the service cost within the price of a good

Dr. James, who leads the research economics group at Battelle, is currently guiding studies of the relationships between research and development and economic growth. In earlier years, he participated in a number of technical-economic studies including research on the economics of ferrous scrap in the iron and steel industry, methods of improving time-deposit accounting in the banking industry, and problems of predicting the state of the art in technology. Previously, at Armco Steel Corporation, he was concerned with the application of engineering standards in production facilities. His service in the Air Force included duty as a Management Analysis Officer in Headquarters, Air Material Forces, Europe.

Leonard Guss, until recently a member of the Institute's Department of Economics staff, participated in studies of the availability of ferrous scrap, expanded use of inorganic materials, developments affecting the packaging industry, and other product-development and business-economics problems. He is at present manager of market research with the Weyerhaeuser Company.

has risen faster than the production cost in recent years.

Unable to develop a logical approach to R & D in the service industries, it became apparent, after some analysis, that the primary lack was a sound foundation on which to build. No philosophical basis had been laid so that the service industries may be viewed in a proper context. Lacking understanding, we were unable to develop wisdom.

Though study in this area of service costs and prices versus product costs and prices will require a considerable amount of time and resources, it is a vital one and should be performed. Meanwhile, it appears justifiable to ask a relevant question. We know that our R & D expenditures have sky-rocketed in the last eight to ten years (and the trend is predicted to continue through the sixties), and that R & D efforts, by their nature, are product oriented: Is it possible that for all the benefits realized from R & D in the product industries, countervailing ills are accruing, at the same time, to the service industries and ultimately to the consumer and the economy?

The Indicative Signs—Irritants

Product research is usually concerned with only one part of what might be called the total economic system—involving the collection of raw materials, the processing of materials, the shaping of a form utility into the product, and its ultimate delivery to a customer.

Using the terms and criteria of the social sciences, what is being dealt with here is tool creation. Services do not fit this rationale since, for the most part, they are concerned with tool use or tool handling. The tool itself, whether it is a product, a material, or a modification of these via a new process, is a physical entity with certain inherent capabilities. These capabilities may be created or enhanced by product research and development. But those who subsequently use the tool may fail to realize the full potential of which it is capable. Such optimum use may not be obtained because the tool was not used at its effective capacity in its individual operation (e.g., a hammer mishandled by a Saturday workman) or because the order of functional performance was not optimized. The mechanisms available for the handling of the tool (product)—be they transport, distributive, or other—are frequently incapable of operating at a rate parallel to that which the tool is able to attain. Indeed, as we shall see, the tool itself may generate this incapacity in other parts of the economic system.

These considerations led to recognition of three classes of problems in the service industries:

1. Those which can be solved by the creation of a new product—in reality a special case of product research.
2. Those which depend upon maximizing the usefulness or inherent capacity of existing products (tools).
3. Those which depend upon the order, method, or manner in which the tools are utilized.

The second and perhaps the third class are merely other ways of saying that these are managerial problems, i.e., making optimum use of the tools available at a given point in space and time by varying order. Interpreting these as managerial problems, the idea occurred to us that these problems might have their origin in product research and development.

This hypothesis was accepted tentatively, and to those results of product research which lead to service problems we applied the term "irritants" because of their effect on the economic system. When irritants are severe enough, or when the economic system is seriously disturbed because a functional similarity exists between groups or classes of irritants, these may be properly called "dislocations". The important thing is that the irritants or dislocations exist because the fruitfulness of R & D creates situations which the services cannot handle; and that some of them—members of the second and third classes—are not amenable to a solution by further product research. Indeed, such product research may merely deepen and widen the extent and degree of irritation by further overloading the capacities of the service industries.

The solution is *not* to throttle down R & D efforts but to increase the effectiveness of the services so that they can adjust themselves to the expanding productiveness of our system.

What is an irritant? It may be thought of as an inconvenience or penalty that the service industries have to pay as a result of product innovation. By definition as stated above, at least some of these penalties and inconveniences cannot be ameliorated or alleviated by further product research, which may, indeed, simply aggravate the problem. We must bear in mind that the innovation is assumed to be fully warranted, useful and beneficial.

What forms do irritants take? As a concept, irritants may take varied explicit forms as illustrated in the following examples. Let us assume a new form of shipping container which must be handled by presently available shipping, transportation, and warehousing facilities. This new container may well be of a form that places undue strain upon rail transportation, yet

possesses sufficient virtues in other areas to assure its adoption. Some of the container's attributes would prove an irritant to the rails and to subsequent parts of the system. Consider also the introduction of frozen foods. This technical innovation required the building or refurbishing of facilities in frozen-food warehouse storage, in special refrigerator boxcars or trailers, in retail institutions, and in the home of the consumer by requiring additional space in refrigerators or separate appliances. The newer pharmaceuticals are another example, the irritant being the sheer volume of minor and major product developments which must funnel through the present system of hospitals, clinics, and physicians—already overburdened with a multiplicity of pharmaceutical variants.

An irritant can be seen in the present day manufacture of bricks and tile, which has become so efficient as to greatly reduce the input of labor required so that many fewer plants are capable of turning out better bricks less expensively than only a few years ago. Yet for the most part, bricklaying procedure has not kept pace and the actual putting in place of the bricks acts as a restrictive irritant to the system. A technological development which portends grave changes in specific service industries is the probable introduction by automotive manufacturers of cars that do not require periodic greasing. This will have a decided impact on the structure of service stations as well as related industries. Thus, the technical irritant can be substractive as well as additive.

Appliances generally create irritants in the variety of color, type, and model which present-day merchandising demands, so that ordering, warehousing, and selling become major problems for retail outlets.

Service Industry	Irritant Type A	B	C	D	E	F	G	H	Number of Irritants in Each Industry
1	x	x	x	x	x	x			6
2			x		x	x	x		4
3		x	x			x			3
4	x		x		x	x		x	5
5		x	x		x		x		4
6			x		x	x			3
Total Industries Affected	2	3	6	1	5	5	2	1	

2. *Hypothetical pattern illustrating how irritants may be related to a group of industries. The number of industries affected will, of course, greatly affect the approach to the removal of the irritants.*

The increasing complexity of appliances and similar devices gives rise to another problem in the servicing area. Many devices are difficult and expensive to repair so that they irritate—indeed, almost dislocate—the system available for maintaining them.

Sheer variety creates its own irritating characteristics. Cigarettes available in long and regular, filter and nonfilter, soft and hard packs, etc., have multiplied like tobacco rabbits. The shelves of any supermarket are loaded in many instances with examples of only slightly differentiated products. The main point is that there exists a class of problems that raises the costs of the service industries and that is not the natural outcome of their performance, but that arises from product research and development. It must be remembered that solving these problems is the raison d'etre for many services. Therefore, it is the responsibility of the services to adjust to the demands created from product R & D. Producers could not and should not be expected to slow their efforts to match the pace of slower developments in the service sector.

When the results of product R & D are thrown into the marketing system, a strain is created in the area known as services, which must absorb or handle them. Conversely, at least some of these irritations generated by product R & D are not removable by the same process of product differentiation which generated them.

What has happened to the irritant introduced by product innovation? If not removed by a further product modification, the irritant is usually absorbed into the system which adjusts to it, probably by the usual mechanism for adjustment—price. In other words, the company (eventually the ultimate consumer) must pay for the inconvenience and dislocation it has caused in introducing product modifications. Therefore, a possible solution is simply to ignore the results of product modification and the increased expense caused by irritant creation. Some may consider that it is easier to pay a penalty in freight, or storage, or repair, or in another form, than to determine an answer to a difficult problem. However, there are three dangers in simply letting price accommodation provide an answer:

1. Inflation, e.g., payment

is exacted for nonproductive efforts.

2. The benefits of product research to the economy and perhaps to the individual user are at least partially lost or diluted by compensatory price increases for the strains introduced.
3. Further product R & D, as past product R & D, will probably continue to introduce such strains and irritations, most likely at an accelerating rate. Unless the services become aware of their responsibility, further R & D developments will be slowed because of the inability of the service sector to handle new problems that would arise.

Who Is to Look After These Irritants?

The job of the profit-guided company is to produce goods at a profit. In modern interpretation, this frequently means manufacturing new or modified products regardless of the impact of those further down the distributive line—barring, of course, dangerous, toxic, or fraudulent goods. Once produced, it is part of the job of the marketing organization to sell the goods to another firm or to an ultimate consumer. Except for repair and maintenance, there the responsibility ends. The product may act as a dislocation or irritant to some other part of the economic system, however desirable it may otherwise be, but this is not usually the concern of the individual corporate management.

The profit-guided corporation management which introduced the changed product cannot look after these irritants. They created the irritant in the normal course of doing business according to the values and needs of the firm for which they work. What solution in any event is available to corporate management? Product withdrawal? This is self-defeating and hardly acceptable to a firm which has labored to innovate, especially since the innovation is frequently desirable in other respects. Further product research? We have agreed that there is a class of service problems to which a product answer is feasible, but there is another—perhaps larger class—which is not so amenable to solution. Additional product research would then not only not solve the problem but probably aggravate it. Product research creates irritants at least as fast as it can solve them, and probably faster, since there seems to be a multiplier effect in product R & D. That is, the unit expended in product R & D creates more than a unit's worth of difficulties as the irritation spreads through the system. The change in shipping container shape cited above would affect not only transportation but areas such as warehousing, inventory policy, and investment.

Industry has taken the inventor and regularized and organized him as a scientist for economic benefit and military security. From this we have obtained benefits in product, material, and manufacturing processes. There is little counterpart to this in the service industries; for the most part the function is unfulfilled. In one sense, the professional manager and the research effort can be considered as parallel sources for problem solving. In terms of company organization, however, the research effort is invariably subordinated to the goals as determined by corporate management. Under these conditions, the manager can benefit from the research effort only in terms of, and within the limits of, the precircumscribed research program. What appears to be lacking is an approach from outside the closed system of professional manager-research effort. This systems approach can extend the effectiveness of product research into the larger economic system.

We concede that certain institutions may be looked upon as concerned with, and possibly doing something about, service irritants. These institutions would include department stores, transportation firms, and warehousing organizations where certain efforts are expended in studies to improve the operation and efficiency of the activities of that particular institution. For the most part, these efforts are *ex post facto*. The irritants are in fact already there and the problem is to minimize or eliminate them through changes that will benefit a single firm or group of firms representing one institution. Actually then, the institutional research efforts, like product R & D efforts in other firms, could lead to creation of further irritants rather than their elimination.

Recognition also must be given to research efforts on commodity flow. For example, we know that various types of research are carried on relating to the planting, growing, harvesting, transporting, and consuming of certain grains. Similarly, other commodities such as copper or lead are or could be researched from point of recovery to ultimate consumption. Again, however, such research does not consider that other products are moving through the economic system simultaneously. The commodity-flow approach would not seem to offer much merit in terms of smoothing out the net irritations and dislocations created by all new or modified products in the marketing system.

Having tentatively set aside the institutional and commodity approaches as not offering valid opportunity, the next path considered as fruitful is the functional study of irritations. Basically, this is the assessment of the system to see: (1) What are the ever-widening effects of the introduction of an irritant

into the economic system? (2) At what point are they severe enough to warrant product development, managerial re-evaluation, cooperative effort, or other palliative? and (3) What points of "bunching up" occur or, in other words, what functional similarities arise from a group of dissimilar innovations that could conceivably be handled by a unitized, systematized approach? By way of demonstration, Figure 2 indicates the bunching up of similar problems in service areas which may arise from a variety of product innovations, but which may be amenable to a unitized solution.

An examination of the figure shows that irritant type C, for example, is common to several nonrelated industries. On the other hand, irritant type D is peculiar to one industry alone and, thus, would not appear to be a likely candidate for a cooperative problem-solving approach. Of course, industry 1, since it is the only industry affected by irritant type D, could undertake a solution alone. It may be noted that Figure 2 also depicts that a major strain may be placed on one industry through a series of dissimilar irritations, e.g., industry 1 affected by irritants A through F.

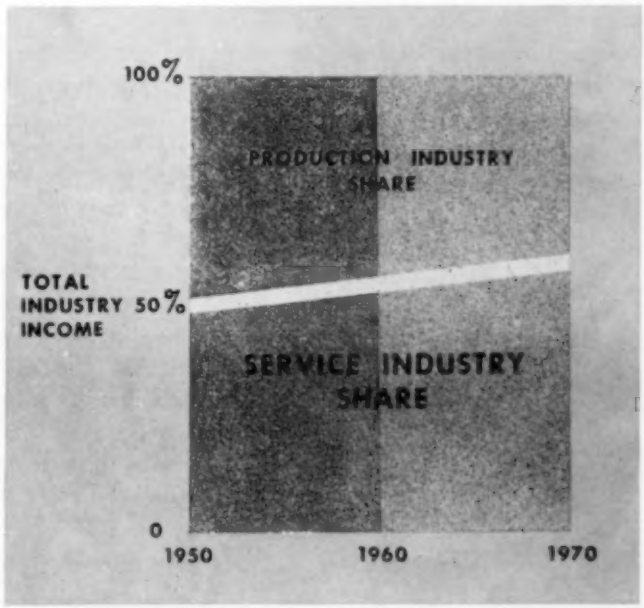
As you recall, the solution to irritant problems might be a new product, but we have assumed that cases exist where it could not be the solution—then it must be a new method or service improvement. A not-too-far-fetched illustration would be the supermarket which, arising as it did from a variety of economic and social causes, yet has managed to solve to a large degree the many collateral problems of enormous product variety, new packaging introductions reinforcing advertising messages, and several other irritations to the economic system.

Other service solutions have been found for problems which originated in product or service areas. These may be specific methods or generalized techniques. Central billing for doctors seems to be a solution for problems generated in part by the increasing complexity of billing for personal services. Operations research is based on the premise of studying an inter- and intra-acting system as a whole. Market research for consumer and industrial products seeks to provide information which will aid in minimizing the side effects of unwanted irritations, among other things.

Who, then, is to look after these irritants? At this point, it appears that the answer is not likely to be found by the types of organizations and firms currently in existence. Their R & D objectives are singular, with little consideration given to the net effect on other parts of the economic system or the whole system. In our estimation, there is no supra-organization today which has assumed the responsibility for anticipating and reducing irritants and dislocations arising primarily through product-oriented R & D. Further, we remain ignorant as to the proper assignment for such responsibility. We might conjecture that it be assigned, say, to some foundation, or a special association of service industries, or perhaps to an economic agency of the government. Other alternatives may be possible, but the selection and design of such an organization properly should come from those most intimately concerned and affected. Our case to this point is built on sensing the problem, its origin, and the fact that there are many organizations which *cannot* do the required analysis.

Products, Services, and Research—Conclusions

All problems associated with service industries are not necessarily traceable to product R & D. If we claimed they were, no allowance could be made, for example, for the abilities and skills of service managers to operate their own business. Certainly these managers have many autonomous decisions such as changes in investment in plant and equipment, adjustments in operating capacities, and personnel selection which can reduce or generate service-connected problems. Many of the problems sometimes generated in this area have, at most, only a remote relation to product changes resulting from R & D. Still, there are undoubtedly thousands of irritating problems appearing in the service industries which stem from the activities of the R & D laboratories; we have presented many examples of these irritants and at the risk of monotonous writing



3. *Straight line projection showing how the service-industries share of total industry income has grown since 1950 and how it may be expected to increase in the next decade.*

could easily present more. As a matter of fact, it is our strong belief that *most* of the major problems facing the service industries today can be directly or indirectly related to the effective activities of the R & D laboratories serving the product industries.

The present attempts to solve these service problems appear to be sub-optimal approaches which, for the most part, generate many more problems in other parts of the service system than are solved in any particuar component of the system. Thus, apparent solutions to problems connected with, say, the retailing function or with a "good" moving through specific channels in the service system often pass on new and difficult problems to other parts of the system. Similarly, product solutions to service problems can do the same thing. Failure to view the product/service complex as a totality (rather than the product complex as a totality) has been in large part responsible for the generation of such difficulties.

Many now contend that we are living in an era of technological revolution. It is difficult to dispute such a contention when the billions of research dollars (supporting huge resources in the form of men and facilities) are seen as inputs and the apparent results (our continuing stream of new products) are seen at the output side. Isn't it about time we took economic stock of this dynamic movement? Have we fully considered that frequently economic theory founded, tested, and accepted in one period of time is discovered to be out-of-date and relatively useless for a later period of time? We can look for R & D payoff in individual firms or an industry or even in military weapons systems, but we are faced with a lack of comprehensive evaluation of the real effect of the economic impact of R & D. Further, almost nothing is known about how the unsolved problems of the services are hindering or affecting the potentialities of R & D.

It is clear that services will come to represent more and more of U.S. expenditures in the future as in the past, as shown in Figure 3. This makes it doubly important that the effects of expenditures for services be not unduly vitiated through irritations arising from product-oriented R & D.

If this is, indeed, the era of the technological revolution, then our continuing efforts to look solely at micro R & D effects in component parts of the economy could prove to be inadequate planning for our economic future.

We believe we have logically demonstrated that product R & D generates chain reactions throughout the entire economic system, and, in the years ahead, this chain reaction is likely to continue with more force than ever before. We have chosen to call some results of this chain reaction merely irritants or dislocations. These are words which could prove to be wholly inadequate. For the consumer and for the growth and welfare of the economic system, the continued creation and growth of irritants, unless understood and controlled, could deny to us a significant proportion of the benefits to be realized from our technological revolution.

"INSPIRATION" OR WORK?

"Creation and intellect. These stereotypes, derived from the Romantic Fallacy, recur periodically in different guises . . . it appears that people who believe in them also believe that *all* creative effort results from blind inspiration and from a total, undisciplined, spontaneous, and absent-minded devotion to an 'ideal' . . . But the fact is that no writer . . . no physicist . . . has ever relied on 'inspiration' alone. The same can be said of the ballerina, the chemist, the journalist, the biologist, or any other person who spends his life in creation. There are genuinely creative business men, the force of whose ideas can turn the whole course of a society. None of these rests on 'inspiration'. As a practical matter, 'inspiration' is hardly more than an impulse to hard work."

Martin Kamen and Beka Doherty,
Brandeis University

NOTES from BATTELLE

DRIVERS AND SIGNALS

A driver's actions on a highway depend to a great extent on the actions of the cars around him. He is informed of what these cars are doing or going to do by a variety of signals which include brake lights, hand signals, changes in speed, changes in direction, and the position of the cars.

Every time he receives such a signal, an experienced driver almost automatically makes a series of three rapid-fire decisions: 1) should a change be made in the operation of the car? 2) if so, what change? 3) once made, was the change successful in meeting the situation?

A basic psychological study of how drivers are influenced by the signals they receive from other cars has been undertaken by Battelle for the U. S. Bureau of Public Roads, in an effort to make highway travel safer, quicker, and easier.

According to Dr. Charlotte Christner, Battelle psychologist in charge of the study, driving today is principally a matter of information handling and decision making. Sound decisions, in turn, depend upon receiving the right information in the right way at the right time.

The present study will attempt to define the problem of communication between vehicles. To do this psychologists will make a detailed analysis of the driving task, investigate the kinds of information the driver needs to make decisions, and determine ways to transmit this information. In addition, they will try to establish standards of driver performance and develop a plan for future experimental research.

Battelle psychologist Horace W. Ray points out that the amount of information a driver has to handle may affect his performance significantly. The available evidence indicates that dangerous situations seem to occur when there are signals from too many cars in too short a time, as on a crowded highway with many intersections, or when there are many signals over a long period of time, as on a long trip over heavily traveled roads. At the other extreme, when there are too few signals over a long period of time, during a long trip over a lightly traveled superhighway, for example, a driver is likely to become drowsy or dangerously inattentive.

Future research may be directed at specifying the amount of information a driver can handle and at what rate and for what period of time. This may make it possible to determine the relationship between the information received by the driver and the efficiency of the traffic flow. Finally, the findings may be applied to specific highway problems.

Dr. Christner emphasizes that the Institute is not looking for a mechanical device to solve present highway problems, but is attempting to identify basic factors that might affect highway systems in the years to come. "The driver's task of making sound decisions on a split-second basis in response to complex and continually changing highway situations will become more difficult in the next few years. To provide a safe, smooth-functioning highway system requires an understanding of traffic-flow problems and of the decision-making and information-transfer process which underlie them," says the Battelle psychologist.

METALS FOR ELECTRON TUBES

Meeting the increasing demands upon electron tubes calls for constant investigation of materials that may contribute to their improvement. As one of the steps in this direction, Battelle technologists recently investigated the properties of columbium and hafnium that make them materials of interest for grid, electrode, and structural members in tubes. Both are ductile, gas-sensitive metals of comparatively high melting points (columbium 2415 C, hafnium 2222 C).

In research for the Techniques Branch of the Electronic Components Research Department, U. S. Army Signal Research and Development Laboratory, Daniel J. Maykuth, James B. Baker, G. Stephen Root, and Gordon B. Gaines arrived at the following tentative conclusions about the value of columbium, hafnium, and their alloys for possible use as electron-tube materials:

- Columbium and Cb - 0.65Zr and Cb - 40Ta alloys show moderate room-temperature strengths and exceptionally good ductility in both the cold-worked and annealed conditions.

- At 1000 C, the columbium alloys are considerably stronger than the unalloyed metal, and the Cb - 0.65Zr Alloy appears outstanding.
- Resistivity/temperature curves for columbium and the afore-mentioned alloys show roughly parallel behavior from 25 to 1700 C. As expected, resistivity values for the alloys are higher at all temperatures.
- On the basis of its good workability, hot strength, and weldability, the Cb - 0.65Zr alloy shows excellent promise as an elevated-temperature structural material for electron tubes.
- Hafnium and hafnium-base alloys require hot working during initial breakdown of the arc-melted ingots and special protection from atmospheric gases is needed during their processing to thin wires and fine sheet.
- Room- and elevated-temperature strengths of hafnium are considerably improved by binary-alloy additions of 1 to 5 per cent of aluminum, columbium, or molybdenum.
- The best combinations of hot workability, cold wire-drawing characteristics, and strength and ductility were found in hafnium alloys containing 2.5 and 5 per cent columbium. Because of their gas-sensitive nature and anticipated low secondary electron-emission coefficients, these alloys show considerable promise as grid anode materials.

* SELENIUM IN RUBBER

Selenium and selenium compounds, it has been noted, act in a manner similar to sulfur in the vulcanization of natural and SBR rubbers. Aging data for selenium-cured vulcanizates, however, have been conflicting. In recent research, conducted at Battelle for the Selenium and Tellurium Development Committee, Institute chemists sought the synthetic elastomers capable of being crosslinked with selenium and studied the effect of the material on the aging of the vulcanizates.

William J. Mueller and Stephen Palinchak report that both selenium and sulfur-cured vulcanizates were prepared from SBR, butyl, chlorinated butyl, neoprene, and Hypalon. In general, with most of the polymers, selenium was found to produce softer vulcanizates (lower modulus and higher elongation) than obtained with sulfur.

Results of the study show that SBR selenium-cured vulcanizates can be produced with tensile strength equal to sulfur-cured specimens, though with higher elongation and lower modulus and hardness. When aged, however, the selenium vulcanizates retained their properties better. Selenium-vulcanized butyl and Hypalon compositions showed aging characteristics essentially superior to those prepared with sulfur; and polyacrylate compositions containing small amounts of selenium in the curing system were found to retain their tensile strengths at 350 F better than those modified with sulfur.

Exploratory studies using selenium and selenium compositions with high temperature-resistant rubbers such as silicones and fluorocarbons indicate that some advantages may be realized in compositions prepared from these elastomers.

* COATED-REACTOR FUEL PARTICLES

A technique for applying impervious coating to minimize fission product release from the nuclear fuel particles used in high-temperature, gas-cooled reactors has been reported by Battelle chemist, Dr. John M. Blocher. In his paper, before the Electrochemical Society in Houston, Texas, last month, Dr. Blocher described techniques for applying dense, uniform coatings to nuclear particles as small as one-thousandth of an inch in diameter.

Both metallic and ceramic materials can be deposited by chemical reactions of vapors at the surface of a bed of heated fuel particles, which are fluidized or otherwise agitated. According to Blocher, this chemical vapor-deposition process makes it possible to produce nuclear fuel particles on a mass-production basis and still meet the specific requirements of each reactor.

A wide variety of materials can be deposited singly, simultaneously, or alternately. Described in detail were such metallic coatings as niobium (columbium), chromium, molybdenum, and tungsten, and Blocher said that alumina and pyrolytic carbon coatings appear even more promising in some respects than the metals. Void structures, burnable poisons, or fertile materials for breeding can also be deposited.

A fuel element consisting of a 1.5-inch-diameter graphite sphere containing approximately 500,000 alumina-coated uranium oxide particles has shown good fission-gas retention during prototype operation in the Battelle Research Reactor. Gaseous fission-product release occurred at the rate of only one part

in ten million—a figure well below the designers' specifications—after 2.5 per cent burnup at temperatures at 1300 to 1500 F. The fuel element is of the same type considered for use in the Pebble Bed Reactor being developed for the Atomic Energy Commission by Sanderson and Porter, Inc.

Dr. Blocher also speculated that uranium carbide, coated with carbon by high-temperature decomposition of hydrocarbons, might be used as a high-temperature reactor fuel element without the necessity of placing it in containers to prevent contamination of the reactor coolant.

Associated with Dr. Blocher in coated fuel-particle research at the Institute are Dr. J. H. Oxley, N. D. Veigel, Dr. W. S. Diethorn, M. F. Browning, T. E. Cook, V. S. Secrest, and A. C. Secrest, Jr.

FUEL-CELL STUDY

A long-term research program to advance fuel cell technology, described as "a major research effort being underwritten by some 25 companies", has just begun at Battelle. The program, presently on a five-year schedule, "will be fundamental in nature and is designed to complement existgovernment, industrial, and academic studies on fuel cell technology", according to Dr. John McCallum, director of the study. "Before the fuel cell's full potential can be realized as a source of power for automobiles, domestic heating and cooling, and industrial processes," he said, "there will have to be a number of inventions, innovations, and breakthroughs. Battelle, with its diversity of scientific disciplines, hopes to contribute to this process of discovery."

"The advantages of the fuel cell as a power source have become clearly apparent, and exciting, to scientists and industrialists," Dr. McCallum observes. "In recent years, a great deal of research has been conducted on fuel cells in various parts of the world, and many people believe that small fuel cells for specialized purposes, particularly military applications, will come into use in the present decade. Still, much new knowledge is needed to answer many complex questions before this revolutionary device can be put into widespread use."

Much of Battelle's research on the fuel cell will be aimed at obtaining a better understanding of the properties of materials required in a cell and developing materials which approach the ideal. In one approach to improved materials Battelle will study the internal electronic structure of alloys to seek an alloy composition with unique electrical and electrochemical properties for cell electrodes. Another approach involves the study of thin films of metals. Thickness of such films greatly affects their properties; and a better knowledge of these properties may be a significant factor in the selection of the right combination of materials for more efficient fuel cells.

Other phases of the research program will include study of active carbon electrodes with metal-chelate surfaces and the use of unusual plating techniques to apply porous metal surfaces to electroformed electrodes for the cell. Concurrent with the experimental work, Battelle will collect from all available sources and interpret new data on fuel cells for the use of participating companies.

The new fuel-cell program will require the specialized research skills of Battelle chemists, chemical engineers, mechanical engineers, mathematicans, metallurgists, and physicists. Among the key members of this group will be Dr. Charles L. Faust, who will supervise electrochemical studies; Dr. Leslie D. McGraw, who will assist him; and Dr. Louis J. Hillenbrand, who will conduct studies on catalysts to promote the electrode reactions.

The companies supporting the research program are major American and European industrial organizations, including chemical, petroleum, transportation, mechanical equipment, public utilities, and engine and automotive manufacturing companies.

ORIGIN OF RARE-EARTH NAMES

The rare-earth metals make up a closely related group of chemical elements whose atomic numbers run from 57 through 71. Indeed, the similarity of their properties makes differentiation between the metals difficult. Little was known about them for many years. Recent research has unearthed much information about the rare earths; and new uses are opening up as a result.

The history of the naming of the individual rare earths reflects their origins and their baffling and elusive properties. It all began in Sweden when cerium, mistaken for tungsten, was discovered by Cronstadt in 1750. Interest in the discovery ran high among chemists everywhere, but because of the importance of Scandinavian scientists in the early developments, half the rare-earth names reflect this influence. *Yttrium, erbium, terbium,* and *ytterbium* were named after the Swedish town Ytterby, where Arrhenius discovered the rare-earth-bearing mineral gadolinite. *Holmium* was

derived from Stockholm, *thulium* from Thule, the early name for far-northern Europe, and *gadolinium* for the Finnish chemist Johann Gadolin. Ironically, Berzelius, the founder of analytical chemistry, who played a leading role in the early analysis of the rare earths, was not one of those honored.

Only four are named for nonScandinavian places or men. The Russian mine officer Samarski provided the inspiration for *samarium*. *Lutetium* was derived from Lutetia, the ancient name for Paris, while the origin of *europium* is obvious. *Cerium* was named for the asteroid Ceres, discovered in 1801.

Some of the early difficulties in separating the elements are reflected in a number of Greek-based names. *Dysprosium* means "the one hard to get at" and *lanthanum*, "the hidden one". Didymium meaning "twin" was the name given to a material which was later found to be composed of two elements. These, in turn, were called *neodymium*, "new twin" and *praeseodymium*, "green twin". *Promethium*, discovered recently, was named after the Greek god, Prometheus.

* Battelle staff members recently named to technical posts include: *Walter K. Boyd*—chairman, High-Purity Water Symposium, National Association of Corrosion Engineers; *Niles G. Foss*—member, Midwest Industrial Marketing Committee, American Marketing Association; *John L. Gray*—member, Atomic Energy Committee *and* Corporate Counsel Committee, Ohio State Bar Association; *William J. Mase*—member, Patents, Trademark, and Copyright Committee, Ohio State Bar Association; *Ernest R. Mueller*—chairman-elect, Division of Organic Coatings and Plastics Chemistry, American Chemical Society; *Edwin M. Sherwood*—Electrochemical Society representative, C-96 Thermocouple Project Committee, American Standards Association.

* "Procedures of Contract Research for Industry", first in a series of illustrated statements designed to define the unique character of the contract research organization, has just been published. It describes the relationship existing between client and research institute. The series will include statements on the means by which clients maintain administrative control of contract research, significant case histories on contract research, and the complementary relationship between the research institute and the client's research staff. Copies of the first statement are available from the Publications Office, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio.

Writings by STAFF Members

Development of Wrought Cobalt-Tungsten-Base Alloys. E. F. Adkins, D. N. Williams, and R. I. Jaffee. *Cobalt*, no. 8, September, 1960, pp. 16-29.

The high-temperature properties of Co-W alloys were seen to compare favorably with those of HS 25. It appears quite likely that improvements could be obtained by suitably modifying their composition or heat treatment. In their present early stage of development, Co-W-base alloys appear to have rupture properties at 982 C (1500 F) superior to those of commercial alloy HS 25. An important advantage of the Co-W alloys is their ability to be hot worked. The potentialities of Co-W alloys for tool applications must be investigated more thoroughly.

Space Radiation as an Environmental Constituent. R. F. Badertscher and R. E. Hess. Paper from *1960 Proceedings of the Institute of Environmental Sciences on Hyper-Environments and Space Frontier*, Institute of Environmental Sciences, Mt. Prospect, Illinois, 1960, pp. 311-316.

Based upon the known charged-particle environment in the Van Allen belts and upon the effects of nuclear radiation on materials and components, it can be deduced that radiation damage to space vehicles will be small or negligible. Long-time exposures greater than a year might cause some damage. Since the basic structures provide some shielding, this time span might be extended by a considerable amount if the critical components are located properly.

Physical and Mechanical Properties of Columbium and Columbium-Base Alloys. E. S. Barlett and J. A. Houck. *Battelle Memorial Institute's DMIC Report No. 125*, February 22, 1960, pp. 62. PB 151 082 (OTS $1.75)

Columbium has good potential as an alloying base because of its low neutron-capture cross section and high melting point, and related potential high-temperature strength. Pure Cb is soft and ductile above 1600 F but elevated-temperature strengthening is accomplished by solid-solution-strengthening and dispersion-hardening mechanisms.

Investigations and Measurements of Properties of Single-Crystal Silicon. Final Report. A. C. Beer, et al. September, 1957, pp. 20. PB 131586 (OTS $0.50)

Investigations were made of methods for determining minority carrier lifetime, resistivity, and charge carrier density and mobility in silicon crystals. Appropriate modifications of measurement techniques were developed to provide good reliability combined with simplicity of operation and ease of application to a given specimen.

Synthesis of Some 5- and 6-Chloro, 5-Methyl, and 5,6,7-Trimethyl Derivatives of Tryptamine. F. Benington, R. D. Morin, and L. C. Clark, Jr. *Journal of Organic Chemistry*, v. 25, September, 1960, pp. 1542-1547.

The preparation of 5-chloro-*N*,*N*-dimethyl-, 6-chloro-*N*,*N*-dimethyl, and 6-chlorotryptamine from the corresponding ring-chlorinated indoles was carried out. Discusses a nine-step synthesis of 5,6,7, *N*,*N*-pentamethyltryptamine from 3,4,5-trimethylacetophenone and the preparation of 5,*N*,*N*-trimethyltryptamine from 5-methylindole. These compounds were prepared for psychopharmacological evaluation.

Availability of Geothermal Energy for the Demineralization of Saline Water. J. C. Bell, R. C. Crooks ,et al. PB 161 400; Office of Saline Water Research and Development *Progress Report No.* 27, July, 1959, pp. 63. (OTS $1.75)

Cost estimates for a so-called "average" example of salt-water evaporation with geothermal energy (i.e. average thermal gradient, 20,000 foot vertical shaft in granite; one foot in diameter) resulted in a calculated cost of over $28 per 1,000 gal. of fresh water. Unusual thermal gradients and a "free" hole might bring this cost below $1 per 1,000 gal., but a rather unique set of circumstances ("free" hole, high gradient, large cooling water supply) would be required to produce such a situation.

The Effect of Selenium on the Machinability and Tensile Properties of Five Per Cent Chromium Steel. Francis W. Boulger. *Transactions of the ASM*, v. 52, 1960, pp. 698-712.

On a weight basis, Se is more effective than S in improving the machinability of hot work die steels. The presence of 0.05% Se improved the machinability ratings of annealed samples by 8% in laboratory tests. Variations in S and Se contents up to about 0.22% had no significant effect on tensile properties of annealed samples. This was also true of samples heat treated to strengths around 278,000 psi and taken parallel with the direction of rolling.

Solubility of Gold in Mercury. John B. Brown. *Journal of Chemical Education*, v. 37, August, 1960, pp. 415-416.

Explains the faulty reasoning behind this popular misconception by a number of references, all but one claiming intensive solubility. Goes on to show that the Au is only "met" by Hg (solubility of Au in Hg is only about 0.14%). Some solid intermetallic Au-Hg alloys are discussed.

Current Tests for Evaluating Fracture Toughness of Sheet Metals at High Strength Levels. J. E. Campbell and W. P. Achbach. *DMIC Report No. 124*, January 28, 1960, pp. 66. PPB 151 081 (OTS $2.00)

Describes procedures used primarily for alloy steels, but which may be used for high strength titanium and aluminum alloys and other metals. These tests involve tensile loading of notched specimens; bending of flat and notched specimens; impact loading of notched specimens; bulging of unnotched, notched, and welded specimens; and combinations of tensile loading and internal pressuring of cylindrical specimens.

Temperature Distributions in a Reactor Fuel Plate. J. W. Chastain, J. K. Long, R. F. Redmond, R. E. Grimble, and R. W. Dayton. U. S. Atomic Energy Commission, BMI-872, September 25, 1953, pp. 60. (LC mi $4.60 ph $9.30)

A large-scale model simulating one channel of a fuel subassembly, proposed for the SCW reactor, was built. The channel walls of the model were heated electrically and the heat was removed by a coolant flowing through the model at atmospheric pressure. The temperature distribution around the periphery was measured for various coolants and flow rates, chosen to bracket reactor conditions. From these data, local heat-transfer coefficients were calculated.

Investigations and Measurements of Properties of Single-Crystal Silicon. II. Measurements of Bulk Lifetime in Silicon. E. Brock Dale, Roger Beck, C. S. Peet, and A. C. Beer. PB 131585. May 1957, pp. 33. (OTS $1.00)

Four methods of measuring the lifetime of nonequilibrium carriers in silicon were evaluated. These are (1) pulse delay method, (2) double pulse method, (3) Fan-Nisenoff method and (4) photoconductivity decay method. Only the last of these was found to combine the virtues of simplicity, reproducibility, and meaningfulness of results.

Preparation and Evaluation of Aluminum-35 w/o Uranium Alloys Containing up to 3 w/o Tin or Zirconium. Norman E. Daniel, Ellis L. Foster, Jr., and Robert F. Dickerson. U. S. Atomic Energy Commission, BMI-1454, July 29, 1960, pp. 28. (OTS $0.75)

The effects of ternary additions of up to 3 w/o Sn or Zr to the Al 35 w/o U extrusion alloy were evaluated on the basis of casting characteristics, UAl_3 retention, extrusion behavior, mechanical properties, and corrosion resistance. Both additions increased the fluidity of the alloy, and both promoted retention of NAl_3. The retention of UAl_3 decreased the extrusion pressure needed for fabrication and caused a corresponding decrease in tensile and creep rupture properties. Reductions in strength were most noticeable at elevated temperatures.

Progress Relating to Civilian Applications During June, 1960. Russell W. Dayton and Clyde R. Tipton, Jr. U. S. Atomic Energy Commission, BMI-1448 (Rev.), July 1, 1960, pp. 121. (OTS $2.50)

Gives recent progress in work being done at Battelle on development of nuclear fuel elements, processing of feed materials, design of components, and characterization and evaluation of nuclear metals and other materials.

Thermal Properties of Materials at Elevated Temperatures. Herbert W. Deem, Webster D. Wood, and Charles F. Lucks. Report for July 1, 1958-June 30, 1959 on Materials Analysis and Evaluation Techniques. PB 161 478; *WADC Technical Note 59-215*, December, 1959, pp. 22. (OTS $0.75)

Apparatus was designed and assembled for making linear-thermal-expansion, specific-heat, and thermal-conductivity measurements to 5000 F or above on metals and ceramic-type materials. Linear-thermal-expansion and specific-heat measurements are made in the same apparatus using the same specimen.

Neutron Dosimetry Research. W. S. Diethorn, E. Paskell, et al. PB 145 939; Quarterly Progress Report No. 3, March 24, 1958, pp. 44. (LC mi $3.30, ph $7.80)

Systems of personnel neutron dosimetry were investigated for application in mixed fields of fast-neutron and gamma radiation.

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Personnel Neutron-Dosimetry Systems. W. S. Diethorn, E. Paskell, et al. PB 145 938; May 15, 1958, pp. 44. (LC mi $3.30, ph $7.80)

Three dosimetry areas were investigated: semiconductor devices, ion chambers, and chemical recoil-proton systems.

Laboratory Test Procedures for Predicting the Tropical-Service Life of Electronic Components and Materials. J. L. Easterday, A. E. Mace, and W. E. Chapin. PB 161 692; March 31, 1959, pp. 122. (OTS $2.75)

Contains the summaried base-line data obtained from over three years' exposure to tropical environments for a wide variety of electronic components.

ML-1-1A Core Studies With the GCRE Critical Assembly. Richard A. Egen, William S. Hogan, David A. Dingee, and Joel W. Chastain. U. S. Atomic Energy Commission, BMI-1396, November 27, 1959, pp. 34. (OTS $1.00)

Critical-assembly studies were conducted to provide physics and engineering data to aid in developing the Mobile Low-Power (ML-1). Two 1A production fuel elements were evaluated in the critical-assembly core. The results predict that the production elements tested contained roughly the same fuel as the critical -assembly element and an additional 772 g of stainless steel equivalent on the average. Radial power and neutron-flux distributions were measured in a 19-pin 1B fuel element. Fairly uniform distributions were observed. Data to evaluate the thermal utilization of this element were obtained.

A Recirculating Supercritical Water Loop. H. M. Epstein, W. H. Goldthwaite, J. W. Chastain, and S. L. Fawcett. U. S. Atomic Energy Commission, BMI-918, October 25, 1954, pp. 20. (LC mi $2.40 ph $3.30)

A recirculating high-pressure stainless steel loop was developed for the study of heat transfer from small-bore tubes to supercritical water. It was found that under certain conditions, hot spots developed on the test section. The conditions leading to the formation of hot spots were investigated.

Metals for Sea Water Service. Frederick W. Fink. *Industrial and Engineering Chemistry*, v. 52, September, 1960, pp. 70A + 2 pages.

Discusses factors in sea-water corrosion of steel, cast iron and wrought iron, Al and its alloys, copper-base alloys, cupro nickels, Monel, Hastelloy C, and Ti.

Selected Informative Abstracts on Thermal Shock and Thermal Fatigue of Cobalt Alloys and Cermets. Ellis Fletcher. Cobalt Information Center, c/o Battelle Memorial Institute, 1960, pp. 66.

Covers the period 1938 to early 1960. Includes a short discussion of the ways in which changes in stress or temperature modify the constant-stress-and-temperature behavior of metals.

Chemical Methods and Apparatus to Supply Breathing Oxygen for Long Space Trips. John F. Foster. Preprint No. 2, Forty-Second National Meeting of the American Institute of Chemical Engineers, Atlanta, Georgia, February 21-24, 1960, American Institute of Chemical Engineers, 25 W. 45th Street, New York 36, New York, pp. 25.

The reduction of CO_2 with hydrogen, and recovery of breathable oxygen by electrolysis of water is a process that appears to be substantially superior to other processes considered. The apparatus has potentially a low weight, great reliability, and good efficiency with low power and energy consumption.

Investigations of Rare-Earth Oxide Cathodes. G. B. Gaines. PB 145 734; Scientific Report No. 1, December 1, 1959, pp. 12. (LC mi $2.40, ph $3.30)

The thermionic emission from two samples each of gadolinium oxide and neodymium oxide was determined. At 1400 C, the emission from one gadolinium oxide sample was about 1 amp/cm^2. At the same temperature, both neodymium oxide samples exhibited an emission of about 0.1 amp/cm^2.

Compatibility of a Number of Metals and Alloys With Graphite. Arnold F. Gerds and Manley W. Mallett. *Transactions of the ASM*, v. 52, 1960, p. 1027-1045.

Copper was the least reactive material tested in contact with graphite. Nickel was only slightly more reactive. Inconel X was the most compatible alloy tested in contact with graphite, although some pickup was observed. Alnicro was the next best alloy. Copper and chromium plating reduced the rate of diffusion of C into Type 316 stainless steel.

Development of a Fuel-Element Leak-Detection System Based on the Principle of Isotopic Exchange. James E. Howes, Jr., Thomas S. Elleman, and Duane N. Sunderman. U. S. Atomic Energy Commission, BMI-1432, August 1, 1960, pp. 18. (OTS $0.50)

The selective removal of halide fission products from an aqueous solution by exchange with the halide in solid silver halide was studied as the basis for a fuel-element leak detector. The retention of fission-product halides on a silver halide column was investigated as a function of coolant flow rate, halide anion, and column size. Fission-product decontamination factors and predicted operating lifetimes were obtained for a number of reactor operating conditions. A sensitive, rapid leak detector for a water-cooled reactor could be constructed from a silver bromide or iodide column monitored by a neutron detector to detect delayed neutrons from the halide fission products.

Creep and Corrosion Properties of Zircaloy-2 Steam at 750 F. Edward J. Jablonowski and Frederic R. Shober. U. S. Atomic Energy Commission, BMI-1457, August 1, 1960, pp. 20. (OTS $0.50)

Test equipment to determine the creep properties of Zircaloy-2 in a 750 F 500 psi-steam atmosphere was designed and constructed. Duplicate tests were performed at stresses to produce failure in approximately 1, 10, 100, and 1000 hr. A comparison between these data and data obtained in vacuum-test equipment shows that corrosive test atmosphere does not alter ductility or failure times appreciably.

Causes of Cracking in High-Strength Weld Metals. A. J. Jacobs, R. P. Sopher, and P. J. Rieppel. *WADC Technical Report* 52-322, PB 145 332; August, 1954, pp. 35. (LC mi $3.00, ph $6.30)

Hot-tension and weld-metal cracking studies were conducted on SAE 43XX-type steels and other selected steels. An increase in carbon, sulfur, and phosphorus tended to lower hot ductility and promote hot-crack susceptibility; a misch metal addition seemed to have the opposite effect.

Plastic Deformation in Grooved Rolls. Henry A. Saller, John R. Keeler, and Lee J. Cuddy. U. S. Atomic Energy Commission, BMI-1040, September 27, 1955, pp. 50. (OTS $1.00)

The direction and extent of lateral deformation during the rolling of rod in grooved rolls was investigated. Composite uranium ingots and laminated ingots of colored modeling clay were used to investigate the deformation in diamond, oval-round, hand-round, and the FMPC breakdown rolls.

The Effects of Radiation on Oxygen Designed for Human Consumption. John F. Kircher, Justin S. McNulty, et al. PB 161 511; WADC Technical Report 59-618, December, 1959, pp. 37. (OTS $1.00)

Liquid and gaseous aviator's breathing oxygen, contained under controlled pressure and temperature in stainless steel vessels, were subjected to gamma irradiation. The rate of ozone formation in liquid oxygen was nearly constant to 5.9 x 10^8 ergs g. $^{-1}$(C), the maximum dose used in these studies. Oxone, formed during irradiation of gaseous oxygen, reached a maximum concentration at about 3 x 10^7 ergs g. $^{-1}$(C) and decreased to an equilibrium concentration at about 10^8 ergs g. $^{-1}$(C).

Oxidation Behavior and Protective Coatings for Columbium and Columbium-Base Alloys. W. D. Klopp. *Battelle Memorial Institute, Defense Metals Information Center, DMIC Report No. 123,* January 15, 1960, pp. 98. PB 151 080 (OTS $2.25)

Four phases occur in the Cb-system: Cb-O solid solution, CbO, CbO_2, and Cb_2O_5. At low temperatures and oxygen pressures, the Cb-O reaction proceeds at a very low linear rate and no scale is formed. At slightly higher temperatures and pressures, an unidentified adherent scale forms and the reaction proceeds parabolically. Parabolic behavior is followed in air to about 400 C, accompanied by formation of a visible tarnish film.

Research Investigations of Multiple-Effect Evaporation of Saline Waters by Steam From Solar Radiation. B. A. Landry. PB 161 377; Summary of Office of Saline Water Research and Development Progress Report No. 2, June 17, 1953, pp. 6. (OTS $0.50)

Describes work on the preparation of preliminary designs, the calculation of performance, and estimates of gross costs of water production.

Studies on Repair Welding Age-Hardenable Nickel-Base Alloys. W. J. Lepkowski, R. E. Monroe, and P. J. Rieppel. *Welding Journal,* v. 39, September, 1960, pp. 392s-400s.

The objective of this investigation was to develop and evaluate techniques of repair welding that would prevent failure during subsequent heating to the temperature where their ductilities are low. Repair welding of two age-hardenable nickel-base alloys, René 41 and Astroloy, was studied. Repair welds were made on restrained, aged materials by several techniques. Samples were then subjected to thermal cycles simulating jet-engine operation.

Temperature Distributions in a Reactor Fuel Plate. III. Parallel Plates With Perpendicular Cylindrical Spacers. J. K. Long, J. W. Chastain, R. F. Redmond, R. G. Jung, and S. L. Fawcett. U. S. Atomic Energy Commission, BMI-907, March 12, 1954, pp. 22. (LC mi $2.40 ph $3.30)

The fuel elements in a proposed configuration for the supercritical-water reactor consist of flat fuel plates separated by cylindrical spacers perpendicular to the plates. Local temperatures were computed in the cylinders and adjacent fuel plates.

A Summary of Comparative Properties of Air-Melted and Vacuum-Melted Steels and Superalloys. D. C. Ludwigson and F. R. Morral. DMIC Report No. 128, March 28, 1960, pp. 144.

The objective is to present under a single cover all the information obtained by DMIC on comparative properties of air-melted and vacuum-melted steels and superalloys. No attempt is made to compare different alloys. The report is confined to the comparison of mechanical properties. Data on inclusion content, gas analysis, and so forth are included only in conjunction with mechanical-property data.

Investigations of Rhenium for Electron-Tube Applications. D. J. Maykuth, G. B. Gaines, G. S. Root, J. B. Baker, R. I. Jaffee, and C. S. Peet. *U. S. Air Forces, Cambridge Research Center, AFCRC TR-60-153,* March, 1960, pp. 80 + 2 appendixes. PB 128750 (LC mi $2.40 ph $3.30)

The study shows that rhenium is relatiyely inert to Al_2O_3, is hardened by carbon, and reacts readily with boron trichloride to form brittle borides. While rhenium does not show unusual properties in alkaline-earth cathodes, rhenium matrices containing tungsten and molybdenum show promise for application in pressed-dispenser-type cathodes. Increasing additions of rhenium to molybdenum and tungsten greatly improve the hot workability, hot strength, low-temperature ductility, recrystallization characteristics, and weldability of these metals. Alloys based on Mo-28Re or W-25Re show optimum properties.

Hyperfine Interaction and the Knight Shift. F. J. Milford. *American Journal of Physics,* v. 28, no. 6, September, 1960, pp. 521-527.

The difference between the magnetic field at which a specific nuclear magnetic resonance occurs in a metal and the field at which the same resonance occurs in a nonmetallic compound is shown as the Knight shift. An elementary derivation of the relationship between the Knight shift and the electronic wave functions is presented here. The current experimental and theoretical situation is briefly reviewed.

Welding of High-Strength Steels for Aircraft and Missile Applications. H. W. Mishler, R. E. Monroe, and R. J. Rieppel. PB 151 074. *DMIC Report 118,* October 12, 1959, pp. 93. (OTS $2.25)

Summarizes the materials and procedures currently being used in the aircraft and missile industry to arc- and resistance-weld high-strength steels. The steels discussed are: low-alloy martensitic steels, hot-work die steels, martensitic stainless steels, hot-work die steels, martensitic stainless steels, and precipitation-hardening stainless steels. For each class of steel, welding techniques and procedures are discussed, arc-welding filler materials are described, and mechanical properties of arc and resistance welds are listed.

Inspecting Taper Threads—A New Technique. A. A. Mittenbergs and Ned Rodgers. *Mechanical Engineering,* v. 82, August, 1960, pp. 43-46.

Describes a new technique for inspecting taper threads which was developed recently for application on the rotary-shouldered connections of tool joints used in drill pipe for oil-well drilling. This technique also can be employed for inspecting taper threads for other applications and for cylindrical threads, which can be considered as taper threads having a taper equal to zero.

Methods for Conducting Short-Time Tensile Creep, and Creep-Rupture Tests Under Conditions of Rapid Heating. Donald P. Moon and Ward F. Simmons. PB 151 078. *DMIC Report 121,* December 28, 1959, pp. 43. (OTS $1.25)

Reviews the equipment and testing methods used by 15 different organizations in the tensile and short-time creep testing of materials under conditions of rapid heating. Special attention is devoted to specimen design, method of heating, and the measurement of temperature, load, and strain during the test. ASTM-recommended practices are cited and relative merits of alternative techniques are discussed.

Structural Damage in Thermally Cycled René 41 and Astroloy Sheet Materials. D. P. Moon, J. A. VanEcho, W. F. Simmons, and J. F. Barker. *DMIC Report No.* 126, February 29, 1960, pp. 24. PB 151 083. (OTS $0.75)

Stress-rupture life at 1650 F and tensile properties at room temperature and at 1400 F were used to determine the extent of structural damage.

A Survey of Current Research and Development in the Field of Dosimetry (First Addendum). Mary J. Oestmann and J. F. Kircher. PB 147 104, *REIC Report* No. 6 (Addendum), March 31, 1959, pp. 21. (LC mi $2.70, ph $4.80)

Advances made during 1958 consisted primarily of refinements of the previously established dosimeter systems. Investigations have involved reaction mechanisms and the determination of more accurate G-values. An appropriate choice of materials helped to extend the useful range of some dosimeters.

Bibliography on Explosive Metal Working. C. T. Olofson and F. W. Boulger. PB 161 201. *DMIC Memo 51*, April 7, 1960, pp. 18. (OTS $0.50)

A considerable amount of effort has been and is being devoted to investigating the advantages and limitations of using explosive energy in metal-working operations. This bibliography was prepared in response to requests by groups considering experimental programs in this field.

Component Evaluation and Specification Engineering. Final Report on Task XXIV. Design of Resistor Load-Life Facility. P. G. Perry. PB 137 516; August 15, 1955, pp. 105. (LC mi $5.70, ph $16.80)

Reports the design of a semiautomatic facility for investigating the load-life characteristics or resistive components.

Temperature Distributions in a Reactor Fuel Plate. II. Parallel Plates With Longitudinal Cylindrical Spacers. R. F. Redmond, J. W. Chastain, J. K. Long, R. G. Jung, and S. L. Fawcett. U. S. Atomic Energy Commission, BMI-906, March 12, 1954, pp. 28. (LC mi $2.70 ph $4.80)

The effect upon the fuel-plate temperature of introducing channel spacers into the proposed curved-plate subassembly for the supercritical-water reactor was studied and evaluated. Two arrangements of short cylindrical spacers in the coolant channels were considered.

Use of Selenic Acid for Plating Microcracked, Protective and Decorative Chromium Plate. W. H. Safranek and R. W. Hardy. *Plating*, v. 47, September, 1960, pp. 1027-1031.

Improved corrosion performance has been obtained with decorative composities of bright nickel and chromium by inducing microcracking in the chromium plate with the addition of selenic acid to the plating bath. With 0.8 mil of bright nickel and 0.55 mil of the microcracked chromium on one set of zinc die cast panels, no basis metal corrosion occurred during 144 hours of copper-accelerated salt spray. Conditions for depositing the microcracked chromium are detailed in this paper.

Plastic Flow During Extrusion of Tubing. H. A. Saller, J. R. Keeler, and L. J. Cuddy. U. S. Atomic Energy Commission, BMI-1021, July 26, 1955, pp. 18. (OTS $0.50)

A study of plastic flow during the extrusion of tubing was made by extruding colored Plasticine billets in a small-scale extrusion press. Decreasing the included angle of the conical die and tapering the ram end of the billet decreased the amount of coextrusion of the backer block into the tubing; lubricating the billet also decreased coextrusion.

The Ductility of Brazed Stainless Steel Joints. H. A. Saller, J. T. Stacy, and N. S. Eddy. U. S. Atomic Energy Commission, BMI-847, July 8, 1953, pp. 14. (LC mi $2.40 ph $3.30)

The ductility of Type 310 stainless steel T-joints brazed with GE-62 brazing alloy was measured at room temperature, 1200, 1650, and 1800 F. At elevated temperatures, the ductility of as-brazed joints approximated that the stainless steel, but at room temperature the brazed joints had only one-tenth the ductility of the base metal. Annealing for 16 hr at 1800 F in air was found to triple the room-temperature ductility of the brazed joint.

Research Services in Connection With Designs for Pyrolytic-Carbon Variable Resistors. I. Siegel, J. R. Reichelderfer, et al. PB 137 550; February 15, 1955, pp. 52. (LC mi $3.60, ph $9.30)

Carbon and borocarbon films were studied for application as variable-resistance elements. Characteristics were determined for lives of 50,000 wear cycles and 1,000,000 cycles.

Factors Influencing the Stability of SBR Latex. F. A. Sliemers, Bailey Bennett, P. B. Stickney, and R. G. Heiligmann. *Rubber Chemistry and Technology*, v. 33, no. 2, April-June 1960, pp. 535-544.

Deals with the nonmechanical factors which contribute to latex destabilization. The study was limited to latex as it is produced in a polymerization plant for later conversion to dry rubber, and did not include latex destined for use as such. The approach to the problem involved attempts to determine the various factors which influence latex stability, systematically study these factors, and assess in quantitative or semiquantitative fashion the relative importance of each factor.

Component Evaluation and Specification Engineering on Task XV. Resistors, Variable, Subminiature. L. H. Stember, Jr., and P. G. Perry. PB 137 810; August 12, 1955, pp. 115. (LC mi $6.00, ph $18.30)

Describes work to determine the ability of components to meet the performance characteristics required by missile guidance systems of the Army Ordnance, and highly specialized electronic equipment of the Signal Corps.

Electron Spin Resonance Spectra of Polymethyl Methacrylate and Polyethyl Methacrylate. I. S. Ungar, W. B. Gager, and R. I. Leininger. *Journal of Polymer Science*, v. 44, June 1960, pp. 295-302.

It is shown that there exists a difference in the electron spin resonance spectra of commercial-grade and laboratory-purified samples of polymethyl methacrylate and polyethyl methacrylate. This difference arises because of the presence of monomer. The spectra of the pure polymers show only partial resolution, while the spectra of samples containing monomer have the nine-line pattern as previously reported.

Method of Testing for Short-Time, High-Temperature Creep Properties of Sheet Materials. J. A. VanEcho, W. F. Simmons, and H. C. Cross. U. S. Air Force, Wright Air Development Center, AFTR 6731, pt. 2, January, 1953, pp. 14. AD 13774. PB 129515. (LC mi $2.40, ph $3.30)

Describes equipment, test-specimen characteristics, and measurement procedure.

A Review of Certain Ferrous Castings Applications in Aircraft and Missiles. John Varga, Jr. PB 151 077. *DMIC Report* 120, December 18, 1959, pp. 54. (OTS $1.50)

Representative types of steel castings are illustrated and discussed. The problems of the aircraft manufacturer and casting producer are presented. Future casting requirements and work that is in progress toward the increased use of castings are discussed.

Relationships Between Impact and Low-Strain-Rate Hydrogen Embrittlement of Titanium Alloys. D. N. Williams and R. I. Jaffee. *Journal of the Less-Common Metals*, v. 2, no. 1, February 1960, pp. 42-48.

Presents data which show that either low-strain-rate embrittlement or impact embrittlement can occur in a-compound, α-β, or β alloys depending on alloy composition and H content. These results suggest that both types of embrittlement are different manifestations of the same basic embrittling process, the rejection of hydride from solution in Ti, and that the type of embrittlement observed is related to the kinetics of hydride rejection.

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ABSTRACTS

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ADMINISTRATION AND PHILOSOPHY OF RESEARCH

11939* Individual Creativity in Research. The ability to think creatively is a quality possessed by many unusual individuals. Most persons can increase their creativity quotient. Suggestions for improving individual creative qualities are presented. ***Lewis E. Walkup.*** *Nondestructive Testing*, v. 18, no. 4, July-Aug. 1960, p. 236 + 5 pages.

11940 Role of the Technical Staff in Product Innovations. Regardless of what mechanism triggers an idea for a new product, it will find its best chances of success in the average company if there exists a strong marketing competence for that particular product, a good cost-minded manufacturing organization, a sound engineering design competence, and an able R and D organization. ***Merritt A. Williamson.*** *Research/Development*, v. 11, Aug. 1960, p. 59-61.

11941 Research Researched. In spite of all of the intangibles, uncertainties, guesses, estimates, and other complicating elements, all research programs must undergo repeated evaluation. The important point is to select the most useful yardstick for the kind of research activity being evaluated and for the time at which it is being evaluated. The first evaluation should be made before any work is done, and further evaluations should be made during the course of the work, or until it is completed or terminated. As the work proceeds, the accuracy of the evaluations should increase and action must be taken on the results of these evaluations. While formulas, checklists, profit analyses, and other semiquantitative guides may be helpful, they do not replace or substitute for sound judgment; in fact, in many cases, they will be inapplicable, and the intuitive, qualitative judgment of experienced men will be the sole basis of a "yes-or-no" decision. One final point should be equally clear; if no funds are invested in research, there will not even be the possibility of deciding whether or not a certain course of future action will be profitable or useful. ***Edward E. Slowter.*** Paper from "Proceedings of the Propellant Thermodynamics and Handling Conference", p. 389-396, June 1960. Engineering Experiment Station, Ohio State University, Columbus, Ohio. (TL785 P94p)

AERONAUTICAL AND ASTRONAUTICAL ENGINEERING

11942 Advances in Space Science. Experimental physics using space vehicles; tracking artificial satellites and space vehicles; materials in space; plasma propulsion devices; electrostatic propulsion systems for space vehicles; attitude control of satellites and space vehicles. ***Frederick I. Ordway, III, editor.*** v. II. 450 pp. 1960. Academic Press, New York. (TL787 Ad95 Vis.)

11943 Materials in Space. Discusses selection criteria, applications, and future outlook of materials for high-temperature service, lightweight pressure vessels, mechanical elements and devices, thermomechanical power systems, solid state electronic devices, instrumentation, and personnel equipment. ***Frederick L. Bagby.*** Paper from "Advances in Space Science", v. II. p. 143-213, 1960, Academic Press, New York. (TL787 Ad95 Vis.)

11944* Aerospace Dictionary. Presents up-to-date expressions in the fields of astronautics and missile science. ***Frank Gaynor.*** 260 pp. 1960. Philosophical Library, New York. (TL789 G25a Ref.)

11945* Saturn Support System. Describes modifications of present missile transporters to accommodate the Saturn booster; considers types of transportation for booster and transporter, including non-rigid airships, sea barges, and highways. Transporter also will be used as an assembly jig for the Saturn Cluster. *GSE; Ground Support Equipment*, v. 2, no. 3, June-July 1960, p. 40-42.

* Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed are available for interlibrary loan.

11946* Support for Atomic Planes. Discusses concepts for ground handling of nuclear aircraft, including mobile equipment and reactor removal followed by servicing in a special facility by remote means. ***William L. Sturdevant, Jr.*** *GSE; Ground Support Equipment*, v. 2, no. 3, June-July 1960, p. 65 + 2 pages.

11947* Some British Research on the Basic Aerodynamics of Powered Lift Systems. Discusses recent R.A.E. and N.P.L. research on the aerodynamics of direct jet lift (turbo-jet and turbo-fan), propeller lift (tilt-wing and deflected slipstream), jet flaps, and boundary layer control (blowing and suction). ***John Williams.*** *Royal Aeronautical Society, Journal*, v. 64, July 1960, p. 413-437.

11948 Surface Effects on Spacecraft Materials. Presents papers given at a symposium held at Palo Alto, California, May 12 and 13, 1959, on the effect of surface thermal-radiation characteristics on the temperature-control problem in satellites; temperature control of the Explorers and Pioneers, coatings for space vehicles; emissivity of materials near room temperature. Vanguard emittance studies at NRL; emissivity, absorptivity, and high-temperature measurements at Armour Research Foundation; material sublimation and surface effects in high vacuum; surface phenomena and friction; measurements of extreme ultraviolet solar radiation and associated photoelectric emissions from solids; interplanetary dust distribution and erosion effects; atomic and molecular sputtering; and other problems. ***Francis J. Clauss, editor.*** 404 pp. 1960. John Wiley & Sons, Inc. New York. (TL787 Sy68s Over.)

11949 Survey of Boundary Layer Heat Transfer at High Velocities and High Temperatures. New cooling methods, like transpiration, ablation, or film cooling were studied. Simple relations are derived by which heat transfer can be calculated with an accuracy which should be sufficient for engineering purposes, and have the advantage that most of them are applicable to any gas or gas mixture. ***Ernst R. G. Eckert.*** *U. S. Air Force, Wright Air Development Division, WADD Technical Report* 59-624, Apr. 1960, 107 pp. (TL507 Un3.18w Vis.)

11950 Effect of Eccentricity of the Lunar Orbit, Oblateness of the Earth, and Solar Gravitational Field on Lunar Trajectories. Comparisons were made between lunar trajectories which were calculated by using the classic restricted three-body equations of motion and lunar trajectories which were calculated by using equations of motion which include terms representing the additional effects. It was found that the oblateness of the earth can modify the trajectories in the vicinity of the moon by several hundred miles or more; whereas, the eccentricity of the moon's orbit and the gravitational gradient of the sun are relatively less important. ***William H. Michael, Jr., and Robert H. Tolson.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-227, June 1960, 37 pp. (TL570 Un3t Room 290)

11951 Analysis of Low-Acceleration Lifting Entry From Escape Speed. An earlier analysis of lifting satellite entry for circular orbit velocities is extended to the case of parabolic orbit velocities. Simple formulas are derived which yield approximations to the minimum loadings for steep entries. The general advantage of operation on the high-drag side of maximum lift-drag ratio is demonstrated analytically. ***Frederick C. Grant.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-249, June 1960, 21 pp. (TL570 Un3t Room 290)

11952 Analysis of Trajectory Parameters for Probe and Round-Trip Missions to Mars. For one-way transfers between Earth and Mars, charts are obtained that show velocity, time, and angle parameters as functions of the eccentricity and semilatus rectum of the Sun-focused conic. From these curves are obtained others useful in planning one-way and round-trip missions to Mars. ***James F. Dugan, Jr.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-281, June 1960, 68 pp. (TL570 Un3t Room 290)

11953 Effects of Jet Billowing on Stability of Missile-Type Bodies at Mach 3.85. Interference effects of two missile-type bodies were investigated in the NASA Lewis 2 x 2 ft. Mach 3.85 wind tunnel. To simulate a rocket jet, pressurized N was exhausted from an annular sonic nozzle. Results indicate that for both models the stability parameter $dC_m/d\alpha$ in the region of zero angle of attack was favorably influenced by the interference resulting from separation due to jet billowing. Schlieren photographs are presented that show the separation due to the jet billowing at various pressure ratios and angles of attack. ***Reino J. Salmi.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-284, June 1960, 17 pp. (TL570 Un3t Room 290)

11954 Effects of Fixing Boundary-Layer Transition for a Swept- and a Triangular-Wing and Body Combination at Mach Numbers From 0.60 to 1.40. The effects of fixing transition for the swept- and triangular-wing configurations were generally insignificant. Since very pronounced effects of fixing transition have been observed for an unswept-wing configuration (reported in NACA TN 4228), is is apparent that significant effects of fixing transition at transonic Mach numbers are to be expected only for wings having little or no sweep. The relatively large increments of minimum drag coefficient due to fixing transition for both configurations at Reynolds numbers of about 1.0 million were substantially reduced as the Reynolds number was increased to about 3.0 or 4.0 million. ***Louis S. Stivers, Jr.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-312, June 1960, 28 pp. (TL570 Un3t Room 290)

11955 Determination of the Internal Temperature in Satellite 1959 Alpha (Vanguard II). Satellite 1959 Alpha was equipped so that accurate measurement of the Minitrack beacon frequency (with the doppler component removed) was sufficient to determine the satellite's internal temperature. To provide a precise measurement of this frequency a sensitive receiving system, utilizing a highly stable but tunable first local oscillator and a noise-eliminating tracking filter, was developed. In addition to the temperature determination, considerable other information such as roll rate and rocket performance was obtained from the observations. ***V. R. Simas, J. B. Martin, and E. C. Humphrey.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-357, June 1960, 18 pp. (TL570 Un3t Room 290)

11956 Variation in Heat Transfer During Transient Heating of a Hemisphere at a Mach Number of 2. Convective heat-transfer tests were made on a 5-inch-diameter hemisphere to determine the variation of Stanton number with the ratio of wall temperature to total temperature. The tests were made at a nominal Mach number of 2 for stagnation temperatures of 760, 1030, and 1380 R. The model was constructed so that radiation effects and also streamwise effects within the model skin were minimized. ***Roland D. English and Howard S. Carter.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-399, June 1960, 26 pp. (TL570 Un3t Room 290)

11957 Effect of Slight Blunting of Leading Edge of an Immersed Body on the Flow Around It at Hypersonic Speeds. A theoretical investigation of the flow about blunt leading-edge bodies, immersed in a hypersonic stream of any gas is undertaken. Utilizes piston and blast-wave theory to study the flow about such shapes as a blunt leading-edge slab, a blunt-nosed cylindrical rod, a thin wedge with a blunt leading edge, and a thin blunt-nosed cone. Expressions are obtained for predicting the surface pressure distribution, the shape of the bow shock, and the drag of these bodies, and these theoretical results are compared with experimental results for several of the cases considered. ***G. G. Chernyi.*** *U. S. National Aeronautics and Space Administration, Technical Translation, NASA TT*-F-35, June 1960, 19 pp. (TL570 Un3tm Room 290)

11958* Calculation of Strong Converging Spherical Shock Waves, Including the Effects of Dissociation and Ionization. Behind the shock front the flow is assumed to be quasi-steady, an assumption which gives the exact solution at high pressures for ideal gases of constant specific heats. Hydrogen was used as a medium. The calculation was carried out step by step to 10,000 K. Shows that the gas is nearly completely dissociated before ionization begins. The equations become very simple when the gas behind the shock front has been ionized. (In German.) Starke kugelsymmetrische Verdichtungsstösse unter Berücksichtigung von Dissoziations- und Ionisationsvorgängen. ***Ingolf Teipel.*** *Zeitschrift für Flugwissenschaften*, v. 8, July 1960, p. 187-202.

See also: **12531** (aircraft hydraulic equipment); **12722** (nondestructive testing of aircraft and missile components).

AGRICULTURE

11959* A Study of the Microorganisms From Grass Silage. I. The Cocci. II. The Lactobacilli. Results show that the cocci isolated from forages fall into two primary groups. Those which produce mostly lactic acid from glucose and those which produce limited amounts of lactic acid along with CO_2, acetic, and traces of other acids. The most frequently occurring lactobacilli in this study were L. brevis, L. brevis (variable), L. casei, L. casei (variable), L. plantarum, L. arabinosus (L. plantarum), and branching lactobacilli. All of the cultures were typical of lactobacilli in that they were facultative anaerobes, gram-positive, nonsporeforming, nonpigmented, and produced mainly lactic acid from glucose. ***C. W. Langston and Cecelia Bouma.*** *Applied Microbiology,* v. 8, no. 4, July 1960, p. 212-234.

11960* The Effectiveness of a Granulosis Virus Applied to Field Populations of *Pieris rapae* (Lepidoptera). In four field experiments, aqueous suspensions of disease particles applied as sprays to natural infestations of *P. rapae* induced epizootics which persisted until the experiments ceased 3-7 weeks later. Larval populations on the disease plots were markedly lower than on the controls. ***F. Wilson.*** *Australian Journal of Agricultural Research,* v. 2, no. 4, July 1960, p. 485-497.

11961* Increase of European Corn Borers Following Soil Application of Large Amounts of Dieldrin. During a five-year period 17,844 acres of Illinois farm land near Sheldon were treated with dieldrin for suppression of a local infestation of Japanese beetles. During 1954 and 1955 fields within the suppression area averaged 2.6 more borers per infested stalk of corn than fields outside of the treated area. It could be that the size of the test area contributed to the increase of corn borers. ***William H. Luckmann.*** *Journal of Economic Entomology,* v. 53, no. 4, Aug. 1960, p. 582-584.

11962* Selection Response and Genetics of Parathion Resistance in the Pacific Spider Mite, *Tetranychus pacificus.* Parathion resistant and parathion susceptible strains of the Pacific spider mite, *Tetranychus pacificus* McG., were derived from certain field populations and established as laboratory colonies. The two colonies were characterized by dosage-mortality curves for the effect of parathion and also Aramite. The colony responded to selection for parathion resistance. ***Lloyd A. Andres and Timothy Prout.*** *Journal of Economic Entomology,* v. 53, no. 4, Aug. 1960, p. 626-630.

11963* The Evaluation of Resistance of Seedling Alfalfa Varieties and Strains to the Spotted Alfalfa Aphid, *Therioaphis maculata.* Of the varieties tested Cody, Lahontan and Moapa exhibited the highest degrees of aphid resistance. ***Wilfred J. Klement and N. M. Randolph.*** *Journal of Economic Entomology,* v. 53, no. 4, Aug. 1960, p. 667-669.

BIOCHEMISTRY AND BIOPHYSICS

11964 Annual Review of Biochemistry. *J. Murray Luck, Frank W. Allen, and Gordon Mackinney, editors.* v. XXIX. 786 pp. 1960. Annual Reviews, Inc., Palo Alto, Calif. (QP501 A78a Vis.)

11965 Feeding the Astronaut. *Robert G. Tischer.* *Astronautics,* v. 5, July 1960, p. 32 + 2 pages.

11966* The Transfer of a Biologically Active Irradiation Product From Cell to Cell. A product exists in a lysogenic organism after ultraviolet irradiation which can be transferred during conjugation to an unirradiated cell wherein it duplicates the effects of direct irradiation. The nature of the irradiated product is unknown but it is apparently not the prophage. ***Ernest Borek and Ann Ryan.*** *Biochimica et Biophysica Acta,* v. 41, no. 1, June 17, 1960, p. 67-73.

11967* Protein Biosynthesis by a Cell-Free Bacterial System. III. Determination of New Peptide Bonds; Requirement for the "Amino Acid Incorporation Enzyme" in Protein Biosynthesis. IV. Exchange of Diphosphonucleosides With Homologous Triphosphonucleosides by the "Amino Acid Incorporation Enzyme". A highly purified preparation of the "amino acid incorporation enzyme" is capable of catalyzing the transfer of phosphate from triphosphonucleosides to homologous diphosphonucleosides (ATP-ADP; UTP-UDP; CTP-CDP; GTP-GDP). Thermal inactivation of this enzyme preparation suggests the existence of four different and specific enzymes each capable of catalyzing the Mg^{++} dependent exchange of one pair of nucleotides. ***Mirko Beljanski.*** *Biochimica et Biophysica Acta,* v. 41, no. 1, June 17, 1960, p. 104-115.

11968* A Model for the Myosin Molecule. Proposes a model based on three equal weight polypeptide chains in the form of a three-stranded α rope. ***W. Wayne Kielley and William F. Harrington.*** *Biochimica et Biophysica Acta,* v. 41, no. 3, July 15, 1960, p. 401-421.

11969* The Form of Crystals of Mahoney Poliovirus Grown in Phosphate-Saline. *J. T. Finch and A. Klug.* *Biochimica et Biophysica Acta,* v. 41, no. 3, July 15, 1960, p. 430-433.

11970* Effect of Mitomycin C on the Synthesis of Bacterial and Viral Deoxyribonucleic Acid. DNA synthesis by bacteria infected with T2r phage was not inhibited by mitomycin C at a concentration sufficient to inhibit DNA synthesis in uninfected organisms. Mitomycin C-treated bacteria resumed DNA synthesis also when infected with either T_3 or T_5 phage. Suggests that virus infection opened a new pathway of DNA synthesis which was originally absent in the uninfected cells and through which the viral DNA was produced in the presence of mitomycin C. ***Mutsuo Sekiguchi and Yasuyuki Takagi.*** *Biochimica et Biophysica Acta,* v. 41, no. 3, July 15, 1960, p. 434-443.

11971 Biological Problems of Grafting. A symposium sponsored by the Commission Administrative Du Patrimoine Universitaire de Liege and the Council for International Organizations of Medical Sciences, Mar. 1959. ***P. B. Medawar.*** 453 pp. 1959. Blackwell Scientific Publications, Oxford. (QP89 Sy68b)

11972 Biometrical Genetics. The Proceedings of an International Symposium held at Ottawa, Aug., 1958, sponsored by the Biometrics Society and the International Union of Biological Sciences are described. Includes theoretical genetics, design of experiments, and experimental results. ***Oscar Kempthorne, editor.*** 234 pp. 1960. Pergamon Press, New York. (QH366 Sy68i)

11973* On Virus Metabolism and Neoplasia. *David S. Nelson and P. M. de Burgh.* *British Medical Journal,* no. 5194, July 23, 1960, p. 252-256.

11974* Water and Electrolyte Changes in Aging Process With Special Reference to Calcium and Magnesium in Cardiac Muscle. Of the tissues studied, the electrolyte pattern of cardiac muscle showed the greatest change with age. There was a general decrease in the concentration of all cations and also of one anion, chloride, in this tissue; phosphate was the only ion to remain constant. The electrolyte pattern of the liver also changed considerably with age; the concentration of all cations decreased with the exception of Ca which showed no variation. ***Kanaka Mori and Jean-Paul Duruisseau.*** *Canadian Journal of Biochemistry and Physiology,* v. 38, Aug. 1960, p. 919-928.

11975 Cholinesterases. A Histochemical Contribution to the Solution of Some Functional Problems. Discusses: humoral cholinesterases, tissue cholinesterases in the nervous system and types of localization at nerve-endings and survey of tissue cholinesterases outside the nervous system. ***M. A. Gerebtzoff.*** v. 3. 195 pp. 1959. Pergamon Press, New York. (QP601 G31c)

11976 Detoxication Mechanisms. The Metabolism and Detoxication of Drugs, Toxic Substances and Other Organic Compounds. Discusses the metabolism of: the simpler aliphatic compounds, aliphatic alcohols, glycols and polyols, some aliphatic aldehydes, ketones and acids, *cyclo*hexane and its derivatives, aliphatic amines and amides and various compounds derived from them, aromatic hydrocarbons, halogenated aromatic hydrocarbons, phenols, aromatic alcohols, ethers, aldehydes, ketones and quinones, aromatic acids, nitriles, aromatic nitro compounds and other compounds; also the metabolism of foreign compounds and the detoxication mechanisms. ***R. Tecwyn Williams.*** 2nd Ed. 796 pp. 1959. John Wiley & Sons, New York. (RS410 W67d2)

11977 Human Biochemical Genetics. An up-to-date review covering areas in which facts were reasonably well established by study and experiment. ***H. Harris.*** 310 pp. 1959. Cambridge University Press, New York. (QH431 H24h)

11978* Genetic Determination and Enzymatic Induction of Tyrosinase in *Neurospora*. *N. H. Horowitz, M. Fling, H. L. Macleod, and N. Sueoka.* *Journal of Molecular Biology*, v. 2, no. 2, June 1960, p. 96-104.

11979* Nucleotide Composition of Soluble Ribonucleic Acid From *Escherichia coli*. *D. B. Dunn, J. D. Smith, and P. F. Spahr.* *Journal of Molecular Biology*, v. 2, no. 2, June 1960, p. 113-117.

11980* Physiological Aspects of Aging. III. The Influence of Aging on Calcium Metabolism in Rats. ***R. Hironaka, H. H. Draper, and J. Kastelic.*** *Journal of Nutrition*, v. 71, no. 4, Aug. 1960, p. 356-360.

11981* Products Obtained by Digestion of the Nucleic Acids of Some Strains of Tobacco Mosaic Virus With Pancreatic Ribonuclease. Maps of the three strains were qualitatively very similar. Quantitative analysis of the various fractions showed no significant differences between strains M and TMV, but revealed several striking differences between the strain HR and the other two strains. ***G. W. Rushizky and C. A. Knight.*** *National Academy of Sciences, Proceedings*, v. 46, July 1960, p. 945-952.

11982* Tissue Culture Populations and Their Relation to the Tissue of Origin. The bulk of the tissue culture population derived from day-old rat liver arises from a cell type other than the parenchymal cell. ***Gordon Sato, Lawrence Zaroff, and Stanley E. Mills.*** *National Academy of Sciences, Proceedings*, v. 46, July 1960, p. 963-972.

11983* Molecular Reorientation as Unifying Principle Underlying Cellular Selectivity. A general hypothesis of the mechanism of selectivity of cellular responses is proposed to embrace a wide spectrum of specific interactions, including immunology, virus infection, fertilization, ingestion, hormone action, cell aggregation, and impulse transmission. It is based on the following assumptions: The cell surface contains a network of long protein molecules with specific end groups. This network acts as a "barrier" to transport and transmission. Complementary groups on an extraneous carrier combine specifically with their counterparts in the cell surface and thereby turn them from tangential into radial positions. This reorientation opens wide "breaches" through the former barrier. These breaches then act secondarily as pores or portals for the more massive, but unspecific, passage of materials and currents. ***Paul Weiss.*** *National Academy of Sciences, Proceedings*, v. 46, July 1960, p. 993-1000.

11984 Isolation of a Non-Pathogenic Tumour-Destroying Virus From Mouse Ascites. A bacteriologically sterile filtrate with a potent destructive effect on the Krebs 2 ascites and the Ehrlich ascites tumors is discussed. Preliminary results show that the sarcoma 37, the Landschutz, the *BP*/8, and the Crocker ascites tumors are also destroyed. That the agent multiplies is shown by its recovery after serial transmission five times in sterile filtrates obtained from washed Ehrlich cells after infection *in vivo*. For the transmission of infectivity *in vivo*, the starting filtrate was found to have unchanged potency up to a dilution of 1:100, with all-or-none tumor destruction occurring at higher dilutions. At 1:1,000, about 30% of the tumors were destroyed, the remaining 70% growing normally to a full yield. ***J. G. Bennette.*** *Nature*, v. 187, July 2, 1960, p. 72-73.

11985* Regeneration of the Lens of the Eye. Parallel experiments in Russia and Britain show that new lenses, near normal in size, shape, and optical density, are produced by implanting foetal tissue in the evacuated lens capsules of adult animals. The research has not yet developed beyond the fundamental stage. ***P. S. Chanturishvili and D. Stenhouse Stewart.*** *New Scientist*, v. 7, June 30, 1960, p. 1650-1653.

11986* Present Status of Oncolytic Virus Studies. ***Chester M. Southam.*** *New York Academy of Sciences, Transactions*, v. 22, no. 8, June 1960, p. 657-673.

11987 Plant Physiology. Cellular Organization and Respiration. A treatise. ***F. C. Steward, editor.*** v. IA. 331 pp. 1960. Academic Press, New York. (QK711 ST49p)

11988 Progress in Industrial Microbiology. Subjects covered in this volume are: lactobacilli; microbiological production of Vitamin B_{12} and sulfide from sewage; developments in fermenter design and fermentation control; biochemistry of streptomycin production; and fungal synthesis of citric, fumaric and itaconic acids. ***D. J. D. Hockenhull, editor.*** v. II. 194 pp. 1960. Interscience Publishers, New York. (QR53 P94)

11989 Progress in Nuclear Energy. Ser. VI. Biological Sciences. Covers the biological aspects of nuclear radiation and the mechanism of radiation injury to all forms of life, from both factual and theoretical angles. Subjects include changes in cell populations, mutations induced by X-radiation, the prediction of mutation patterns, erythropoesis, advances in radiation mutagenesis, genetic damage and aging effects and the problem of radiosensitivity. ***J. G. Bugher, J. Coursaget, and J. F. Loutit, editors.*** v. II. 422 pp. 1959. Pergamon Press, New York. (QC776 P94n)

11990* Hypothermia and Ischemia of the Bone Marrow as Protection Against Injury by Whole-Body X-Irradiation in Rats. Findings suggest combined hypothermia and ischemia of the hind legs during irradiation protected elements of the bone marrow which later contributed to the recovery of the animals from the radiation insult. ***Edgar J. Martin.*** *Radiation Research*, v. 12, no. 6, June 1960, p. 705-709.

11991 Recent Progress in Hormone Research. Proceedings of the Laurentian Hormone Conference 1959. Discusses the mechanism of hormone action, peptide hormones, thyroid hormones, and hormones and metabolism. ***Gregory Pincus, editor.*** v. XVI. 608 pp. 1960. Academic Press, New York. (QP801.H7 R24 Vis.)

11992 Continuous Culture Process Applied to the Pharmaceutical Fermentation Industry. Considerable interest is being shown in continuous culture methods; however, their present state of development is not sufficiently advanced to suggest that such techniques will be widely adopted in the near future. ***M. Lumb and G. D. Wilkin.*** *Research Applied in Industry*, v. 13, July 1960, p. 257-260.

11993 Miniature Electronic Instruments for Medical Research. ***D. W. Baker, D. L. Franklin, and R. M. Ellis.*** *Research Applied in Industry*, v. 13, July 1960, p. 275-280.

11994* Experimental Epilepsy in the Mouse. Chronic epilepsy has been produced in the mouse by cerebral implantation of powdered Co and Ni. ***Lenore M. Kopeloff.*** *Society for Experimental Biology and Medicine, Proceedings*, v. 104, no. 3, July 1960, p. 500-504.

11995* Fragrance in the Natural Orders. . . . of wild and cultivated, temperate and tropical zone flowers. ***E. S. Maurer.*** *Society of Cosmetic Chemists, Journal*, v. 11, no. 4, May 1960, p. 205-220.

11996 Synthetic Analgesics. I. Diphenylpropylamines. Describes and discusses the present state of knowledge of the methods of synthesis and the physical and chemical properties, as well as the analgesic activity, of diphenylpropylamines. Other pharmacological properties of these compounds are mentioned. ***Paul A. J. Janssen.*** 183 pp. 1960. Pergamon Press, New York. (QD399 J26s)

11997 Vitamin B_{12}. Origin and distribution of Vitamin B_{12}, isolation, chemistry, biogenesis: isotopic labeling, derivatives, analogues, antimetabolites assay of Vitamin B_{12} and analogues,

Vitamin B_{12} binding factors, absorption, excretion and distribution in the body, diagnosis and treatment of megaloblastic anemia, Vitamin B_{12} in animal and human nutrition and mechanisms of action are discussed. ***E. Lester Smith.*** 196 pp. 1960. John Wiley & Sons, New York. (QP801.V5 Sm55v)

See also: **12127** (medicinal chemistry).

CERAMICS AND CONCRETE

11998 Multicored Die Cuts Brick Weight. Approaches the problems of lightweight clay products by using multicolored dies instead of lightweight aggregate. Attains a considerable weight reduction by reducing the amount of clay used. A further development might involve combining the idea with lightweight aggregate as a batch addition. ***James L. Clark.*** *Brick & Clay Record*, v. 137, no. 1, July 1960, p. 48-49.

11999 Pulverize Ceramic Materials With No Moving Parts. A new mill impacts particles against themselves while entrained in two opposing streams of steam. The mill is an efficient, low-cost method of reducing the particle size of hard abrasive ceramic raw materials and calcines. It pulverizes materials into uniform particle sizes as low as 5 microns. *Ceramic Industry*, v. 75, July 1960, p. 56-57.

12000 First Ceramic Gyros Put U.S. ICBM's Right on Target. This gyro was made possible by two major achievements. One was the development of a 96+% high-Al_2O_3 ceramic material that can be diamond-honed into the tiny and ultra-precise shapes of critical gyro parts. The other was the development of a miniature ceramic self-generating gas bearing. The combination of ceramics and gas bearings sharply reduces the prime causes of gyro drift inaccuracies, and results in a gyro with a theoretical life span approaching infinity. *Ceramic Industry*, v. 75, July 1960, p. 58-61.

12001 The Relationship Between Mineral Content and Mechanical Properties of Magnesite Bricks. The important phases present in bricks may be determined with the microscope or from the $CaO:SiO_2$ ratio obtained by chemical analysis. From these data it is possible to predict strength and heat resistance. (*In German.*) Zusammenhänge zwischen Mineralbestand und Prüfdaten von Magnesitsteinen. ***P. Wecht.*** *Deutsche Keramischen Gesellschaft, Berichte*, v. 37, no. 6, June 1960, p. 252-254.

12002 Selected Abstracts on the Mechanical Behavior of Ceramics. Covers deformation and creep in ceramics and ionic solids, underlying mechanisms, processing, structure and properties of materials, uses of mechanical and heat-resistant ceramics and cermets, research and testing methods, and metallurgical concepts applicable to studies in ceramics. ***Hayne Palmour, III, et al.*** *North Carolina State College, Department of Engineering Research, Bulletin No.* 73, July 1959, 151 pp. (TA21 N81b Vis.)

12003* Physical Appearance and Indication of Zirconium Oxide-Containing Inclusions in Glass. Nonvitreous inclusions in glass, originating from Zr-containing refractory material, have characteristics well developed in some individual specimens. Microscopic examination can often be made without special preparation of the specimens; the development of baddeleyite dendrites in places where ZrO_2-substances exist is remarkable. (*In German.*) Habitus und Indikation zirkonoxydhaltiger Einschlüsse im Glas. ***H. Jebsen-Marwedel.*** *Sprechsaal*, v. 93, no. 14, July 20, 1960, p. 383-388.

12004 Investigation of Graphite Bodies. Objectives were to correlate the properties of small multicrystalline graphite specimens with factors known to influence them, and to use this correlation to guide the preparation of strong, nearly isotropic, non-impregnated graphite specimens having reproducible properties. The effects of fine aggregate packing on density, modulus, and strength are discussed, and these properties are given for experimental graphites. ***Samuel W. Bradstreet, Leon M. Atlas, Seymour A. Bortz, H. Howard Lund, and H. Henry Nakamura.*** *U. S. Air Force, Wright Air Development Division, WADD Technical Report* 59-706, Apr. 1960, 107 pp. (TL507 Un3.18w Vis.)

12005 Corrosion Resistance of Various Ceramics and Cermets to Liquid Metals. Discusses procedures used for the corrosion screening testing of ceramics and cermets in liquid Li, Na, and Pb. Results of such tests on various ceramics and cermets exposed for 100 hr to the liquid metals at 1500 F are given. These include various borides, carbides, nitrides, oxides, and silicides for the ceramics. The major part of the cermet screening corrosion tests reported are on tungsten carbide- and titanium carbide-base cermets. ***W. H. Cook.*** *U. S. Atomic Energy Commission, ORNL*-2391, June 15, 1960, 26 pp. (UF767 U3o Contin.)

12006* Elastic Constants of Synthetic Single Crystal Corundum at Room Temperature. Elastic properties were determined in the kc per sec frequency range by an accurate resonance method. Results were checked in the megacycle per sec range with a less accurate, pulse velocity method. The elastic moduli for polycrystalline alumina calculated from the single crystal compliances determined by the resonance method are in good agreement with experimental values obtained on high density polycrystalline alumina. ***J. B. Wachtman, Jr., W. E. Tefft, D. G. Lam, Jr., and R. P. Stinchfield.*** *U. S. National Bureau of Standards, Journal of Research, Section A, Physics and Chemistry*, v. 64A, no. 3, May-June 1960, p. 213-228.

See also: **12625** (glass-mold manufacture).

CHEMICAL ENGINEERING

12007 Unsteady Turbulent Heat Transfer in Tubes. Analysis is made in a circular tube whose wall temperature varies arbitrarily with time. The formulation permits the heat-transfer coefficient to vary with time and position in accordance with the energy conservation principle. ***E. M. Sparrow and R. Siegel.*** *ASME, Transactions, Series C, Journal of Heat Transfer*, v. 82, no. 3, Aug. 1960, p. 170-180.

12008 Emulsification With Ultrasonic Waves. I. Evaluation of the Minisonic and a modified analysis procedure. ***Robert E. Singiser and Harold M. Beal.*** *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 49, July 1960, p. 478-481.

12009* Dielectric Investigations on Molecular Sieves. Linde molecular sieves form caged inclusion compounds with non-electrolytic molecules. The possibility of an inclusion is decisively determined by the molecular diameter. As no safe thermodynamic data are available, the relaxation time can be used as a comparative measure for the molecular radius, as far as molecules of approximately spherical (coiled) shape with rigidly built in dipoles are concerned. (*In German.*) Dielektrische Untersuchungen an Molekularsieben. ***F. Oehme.*** *Angewandte Chemie*, v. 72, no. 14, July 21, 1960, p. 489-493.

12010* Exergy Diagrams for Water and Water Vapor. Presents diagrams for obtaining the exergy (technical work capability) of water and water vapors and two practical examples are calculated with these diagrams. (*In German.*) Exergiediagramme für Wasser und Wasserdampf. ***Zoran Rant.*** *Brennstoff-Wärme-Kraft*, v. 12, July 1960, p. 297-301.

12011* Industrial Gas Cleaning. Surveys equipment available for the separation, agglomeration, and collection of dusts and mists. ***N. Pilpel.*** *British Chemical Engineering*, v. 5, Aug. 1960, p. 542-550.

12012* Performance of Plate Heat Exchangers. A corrugated plate exchanger in operation at a Russian sulfite pulp plant. *British Chemical Engineering*, v. 5, Aug. 1960, p. 559-560.

12013* The Purification of Inert Gases by Hot Uranium. II. Theory and experimental results as applied to gas purification in simple cases. Discusses the reactions involved, particularly uranium-carbon monoxide. ***P. C. Davidge, N. Hodge, and G. N. Stockdale.*** *British Chemical Engineering*, v. 5, Aug. 1960, p. 566-569.

12014* Studies of Bubble Formation and Rise. Preliminary to mass transfer studies, studies of bubble shape and area during formation and of velocity of rise after formation were made for N bubbles in water and in two hydrocarbon oils. ***A. A. Poutanen and A. I. Johnson.*** *Canadian Journal of Chemical Engineering*, v. 38, no. 4, Aug. 1960, p. 93-101.

12015* Oxidation of Ethylene Using Silver Catalyst Coated Strips in an Inert Fluidized Bed. ***E. Echigoya and G. L. Osberg.*** *Canadian Journal of Chemical Engineering*, v. 38, no. 4, Aug. 1960, p. 108-112.

12016* Evaporation Rates in Spray Drying. Heat and mass transfer coefficients were determined during the evaporation of water sprays produced by pneumatic atomizing nozzles in a vertical, concurrent, spray dryer under various operating conditions. ***J. Dlouhy and W. H. Gauvin.*** *Canadian Journal of Chemical Engineering*, v. 38, no. 4, Aug. 1960, p. 113-120.

12017* Evaporation Losses From Crude Oils. The vol.% of the bottoms in the crude oil and its residues were used to calculate the evaporation losses suffered by the crude in order to yield the various residues. ***P. M. Dranchuk, D. L. Flock, and J. W. Gregg.*** *Canadian Mining and Metallurgical Bulletin*, v. 53, no. 579, July 1960, p. 447-482.

12018* Digestion of Waste Sludge by Sulphate Reducing Bacteria. Possible advantages of this process are: improved digestion of grease; improved digestion of hair, feathers, skin and other keratins; conversion of relatively cheap sulfates to the more expensive H_2S, free S or SO_2; possible digestion of sludges deficient in N; and possible conversion of waste organic material to hydrocarbons. *Chemical Age*, v. 84, July 9, 1960, p. 60.

12019* Adsorption and Its Application to Solvent Recovery. Reviews theories of adsorption, and the general principles of the application of adsorption to solvent recovery. ***D. J. Spinkins.*** *Chemical & Process Engineering*, v. 41, July 1960, p. 277 + 4 pages.

12020 New Plant Counters Helium Shortage. Describes operation of the plant; discusses purification of natural gas, separation of He and purification of crude He. *Chemical Engineering*, v. 67, July 25, 1960, p. 96-99.

12021 Rundown on Saline Water Conversion. The Office of Saline Water plans to build five plants throughout the country, each demonstrating a different conversion process: in a long tube vertical evaporator the saline water is boiled by condensing water vapor or steam on the shell side; a plant to apply a multistage flash distillation; a plant for conversion by electrodialysis; a plant using a forced-circulation vapor compression; and a plant which will freeze the water and remove it from the brine. *Chemical Engineering*, v. 67, July 25, 1960, p. 105-108.

12022 Take the Pressure Off Distillation Columns. A column which uses rotary instead of bubble-cap trays gives low pressure drop for high throughput. *Chemical Engineering*, v. 67, Aug. 8, 1960, p. 82 + 1 page.

12023 Solid-Solid Blending. Theory, practice, equipment, and economics of this important operation. ***John J. Fischer.*** *Chemical Engineering*, v. 67, Aug. 8, 1960, p. 107-128.

12024 Characteristics for Formed Pressure-Vessel Heads. Nomograph gives a convenient method of estimating characteristics for three commonly used types of formed heads for pressure vessels. ***R. D. Biggs.*** *Chemical Processing*, v. 23, Aug. 1960, p. 49 + 1 page.

12025 Water Dispersion of Polyvinylidene Chloride Brings Film-Form Advantages to Coated Substrates. *Chemical Processing*, v. 23, Aug. 1960, p. 60-63.

12026 Charge-Breaker Brings Down Colloid Control Costs. Promises purification of raw waters by control of ζ potential with the Riddick cell. *Chemical Week*, v. 87, no. 6, Aug. 6, 1960, p. 26-28.

12027* Hydrogen Peroxide From Petro-Chemical Materials. In the cyclic reduction-oxidation process alkyl anthraquinone is first reduced to anthrahydroquinone and then decomposed by autoxidation to anthraquinone and H_2O_2. A second process depends on the partial oxidation of lower aliphatic alcohols, principally, isopropanol. (*In German.*) Wasserstoffperoxyd über petrochemische Rohstoffe. ***P. W. Sherwood.*** *Chemie-Ingenieur-Technik*, v. 32, July 1960, p. 459-461.

12028* The Kinetics of Carbon Gasification. III. Discusses the reaction of C with CO_2 and dissociated gases. ***J. D. Blackwood.*** *Coke and Gas*, v. 22, July 1960, p. 293-297.

12029* Interference of Organic Contaminants With Ion Exchange Processes—Occurrence, Prevention and Cost. ***Hilary E. Bacon and W. J. Lewis.*** *Combustion*, v. 32, no. 1, July 1960, p. 37-41.

12030 Fluidization and Fluid-Particle Systems. Provides a convenient, centralized information source on all major aspects of fluid-particle technology. Examines fluid flow through fixed beds and presents a generalized correlation for calculating the rate of entrainment of solids from fluidized beds for any particle size and distribution, and superficial fluid velocity. ***Frederick A. Zenz and Donald F. Othmer.*** 513 pp. 1960. Reinhold Publishing Corp., New York. (TP156.F65 Z47f)

12031* Controlled and Automatic Additive Dispensing. *Fuel Efficiency*, v. 8, July 1960, p. 396.

12032 Distillation. Theory and Fundamentals. Multicomponent tray-to-tray calculations using computers point the way to improved tower efficiencies. ***J. A. Gerster.*** *Industrial and Engineering Chemistry*, v. 52, Aug. 1960, p. 645-653.

12033 Industrial Applications of the Metal Organic Compounds. Future possibilities of the organic compounds of Cu, Ag, and Au. ***J. H. Harwood.*** *Industrial Chemist*, v. 36, July 1960, p. 325-330.

12034 Heat Transfer in Beds of Fluidized Particles. A review. ***H. Bannister.*** *Industrial Chemist*, v. 36, July 1960, p. 331-337.

12035* Basic Factors in Centrifugal Pump Application. III. Characteristic Curves and Centrifugal Pump Relations. ***Roy Carter and Igor J. Karassik.*** *Industrial Wastes*, v. 5, no. 4, Aug. 1960, p. 78-82.

12036* Functional Relationship Between the Grain Size of the Catalyst and the Area Where the Reaction Takes Place. A link was found between the temperature at which the passage into the diffusion area begins and the dimensions of the grains of the catalyst. Tests with coarse-grained and pulverized catalysts confirm the possibility of using the relationship found in calculations and to determine the region of reactions according to the method described. (*In Russian.*) Zavisimost' mezhdu razmerom granul katalizatora i oblast'iu protekaniia reaktsii. ***Iu. M. Zhorov and G. M. Panchenkov.*** *Izvestiia Vysshikh Uchebnykh Zavedeñ, Neft' i Gaz*, v. 3, no. 7, 1960, p. 65-68.

12037* A Contribution to the Study of Amphoteric Ion Exchanger Resins. Resins having acid and basic functions in very definite positions in the macromolecular network were prepared. Work consisted in the development and quantitative determination of polyfunctional resins having a hydrocarbon skeleton of the formophenole or polystyrene type. Certain difficulties encountered when preparing and using an amphoteric resin-ion exchanger were determined. (*In French.*) Contribution a l'étude des résines amphotères échangeuses d'ions. ***Roger Lumbroso.*** *Journal des Recherches du Centre National de la Recherche Scientifique*, no. 50, Mar. 1960, p. 33-53.

12038* Mass Transfer and Chemical Reaction in Liquid-Liquid Agitation Systems. Found that the effect of agitation upon the liquid-liquid mass transfer was mainly to increase the interfacial area, that the decrease of the mass transfer resistance in the diffusion film outside droplets was slight, and that the mixing of the inner part of the droplets was decreased by the increase in agitator speed. ***Shinji Nagata and Iwao Yamaguchi.*** *Kyoto University, Memoirs of the Faculty of Engineering*, v. 22, pt. 2, Apr. 1960, p. 249-276.

12039* Changes in Pharmaceutical Production. Describes modern methods of mixing, granulating and drying, tablet compressing and coating, sterilizing; packaging operations, plastics materials and constructions. ***E. K. Samways.*** *Manufacturing Chemist*, v. 31, July 1960, p. 284 + 2 pages.

12040* Recent Trends in Evaporator Design. Discusses evaporators for handling comparatively valuable and/or heat-sensitive materials in the pharmaceutical and fine chemicals industry. Includes a section on the selection of equipment, design and economics. ***P. J. King.*** *Manufacturing Chemist*, v. 31, July 1960, p. 295-300.

12041 12,600 bbl. of Liquids Daily From 169 M.M.c.f. of Wet Gas. Design basis for a new $3,855,000 gas plant in Texas; costs; flowsheet of process. ***H. C. Bozeman.*** *Oil and Gas Journal*, v. 58, no. 31, Aug. 1, 1960, p. 131-132.

12042 Good Design and Layout Can Tame Hazardous Area. ***D. G. Santini.*** *Oil and Gas Journal*, v. 58, no. 31, Aug. 1, 1960, p. 134.

12043* Supplemental Drying Through Radiant Heating. A compact source of heat for drying—radiant heating offers advantages for many purposes—can be used at wet end of machine or for drying coatings. ***G. R. Van Kampen.*** *Paper Mill News*, v. 83, no. 30, July 25, 1960, p. 42 + 1 page.

12044 Production of Microballoons and Experimental Polyvinyl Emulsions. Use of a second-hand Bowen spray dryer to produce microballoons for reducing evaporation loss of crude oil. *Plastics Industry*, v. 18, July 1960, p. 24.

12045 Principles of Chemical Thermodynamics. Presents some novel innovations for a better understanding of the subject. ***Charles E. Reid.*** 306 pp. 1960. Reinhold Publishing Corp., New York. (QD501 R26p)

12046 Proceedings of the 1960 Heat Transfer and Fluid Mechanics Institute. Meetings held at Stanford University, June 15-17, 1960. Presents results of fundamental research of current interest in heat transfer, fluid mechanics, and related fields. The 18 papers range from magnetohydrodynamics to minimum mass thin fins for space radiators. ***D. M. Mason, W. C. Reynolds, and W. G. Vincenti, editors.*** 259 pp. 1960. Stanford University Press, Stanford, Calif. (QC320 H35pr Vis.)

12047 Progress in Cryogenics. Discusses storage and handling of cryogenic liquids, gas refrigerating machine, separation of deuterium on an industrial scale, low-temperature bubble chambers, the 1958 scale of temperatures for the liquid He-4 region, resistance thermometers for low temperatures, the three level solid state maser, methods of nuclear orientation. ***K. Mendelssohn.*** v. II. 280 pp. 1960. Academic Press, New York. (QC278 P94 Vis.)

12048* Some Problems of High Pressure Equipment in the Chemical Industry. A survey concerning the tightness of pressure vessels, internal part of reactors and design of boilers in electrical reactors, deterimnation of level of liquid in high-pressure vessels, design of high-pressure valves and of pipe joints, fatigue resistance in water coolers, and safety in service. (*In Polish.*) Niektóre zagadnienia aparatury wysokociśnieniowej w przemyśle chemicznym. ***Wacław Hennel.*** *Przemysł Chemiczny*, v. 39, no. 5, May 1960, p. 316-322.

12049* The Nature of Fatty Acids and Fatty Alcohols. *Soap, Perfumery & Cosmetics*, v. 33, July 1960, p. 744 + 6 pages.

12050* Water Conservation by External Re-Use. Reviews practicable methods of handling discharge process waters for their re-use. ***L. L. Klinger.*** *Tappi*, 43, July 1960, p. 669-672.

12051* Water. Outlines the great importance of water for the people and recommends measures, enforced by the law, to guarantee a careful use of it. ***John P. Baum.*** *Textile Industries*, v. 124, July 1960, p. 133-134.

12052 Twentieth Annual Water Conference, Proceedings. Held October 26-28, 1959, Penn-Sheraton Hotel, Pittsburgh 30, Penna. Consists of ten papers. Twentieth Annual Water Conference, Proceedings (Annual Volume), 159 pp. 1959. Engineers' Society of Western Pennsylvania, Pittsburgh. (TD201 En33a Vis.)

12053 An Investigation of a "Dynamic" Theory for Mass Transfer. Proposes a new theory which permits computation of individual "dynamic" mass-transfer coefficients from physical data. Retains the concept of the existence of resistance films at an interface. ***R. B. Schappel.*** *U. S. Atomic Energy Commission*, Y-1298, May 13, 1960, 115 pp. (UF767 Un3.1y Contin.)

12054 Development of Plastics Solar Stills. Demonstrates that it is possible to construct plastic solar stills with an efficiency up to 92% of that of identically designed glass stills. *U. S. Office of Technical Services, PB* 161398, Feb. 1959, 25 pp. (T21 Un3r Contin.)

12055* Linear Output Flow Meter. Indicates water flow by direct readings. ***Wm. Bruce Murray.*** *Water & Sewage Works*, v. 107, July 1960, p. 269-272.

See also: **12089** (phosphoric acid manufacture); **12177** (ceramic infrared heat from gas); **12371** (Society of Rheology, Transactions); **12444** (sieving screen efficiency).

CHEMISTRY—ANALYTICAL

12056* Contributions to the Polarography of Beryllium. Beryllium salts in basic solutions containing lithium chloride or $[N(CH_3)_4]I$ proved to disclose two polarographic waves between pH 3.5 and 4.4. The height of the second wave is in the concentration domain 0.8×10^{-5}–6×10^{-5}-M proportional to the concentration of Be. In the mentioned interval of pH values, the wave proved to be readily evaluable and also suited for analytical purposes. (*In German.*) Zur Polarographie Des Berylliums. ***K. Györbiró.*** *Acta Chimica Academiae Scientiarum Hungaricae*, v. 22, no. 2, 1960, p. 225-233.

12057 Separation of Steroids by Gas Chromatography. Conditions suitable for effective separations were found through use of a silicone gum coated on Chromosorb *w*. Methyl silicon polymer SE-30 used in the gas chromatographic technique for detection and separation of closely similar steroids and alkaloids has cut drastically the long retention times and high temperatures which were once needed for these molecules. ***W. J. A. VandenHeuvel, C. C. Sweeley, and E. C. Horning.*** *American Chemical Society, Journal*, v. 82, July 5, 1960, p. 3481-3482.

12058* A Study of Octadecenoic Acids by Gas-Liquid Partition Chromatography and Infrared Spectrophotometry. Separation of geometric isomers of octadecenoic acid methyl esters from commercially hydrogenated oils by means of G.L.P.C., using a capillary column coated with Apiezon L. Comparisons with a conventional column packed with a polyester and with *trans*-isomer values from infrared spectrophotometry. ***F. L. Kauffman and G. D. Lee.*** *American Oil Chemists' Society, Journal*, v. 37, Aug. 1960, p. 385-386.

12059* A General Method for the Chromatographic Analysis of Mono-, Di-, and Triglycerides and the Mono- and Diesters of Ethylene Glycol and Polyethylene Glycol. ***Gerald J. Papariello, et al.*** *American Oil Chemists' Society, Journal*, v. 37, Aug. 1960, p. 396-399.

12060* A New Gas Absorption Device—Its Application to Titrimetric and Conductometric Micro Determinations of Carbon Dioxide in Air. Device is capable of absorbing gases from a stream of air (up to 15 ml/min) in a small volume (about 0.5 ml) of absorbing fluid. The absorbing area of contact between air and liquid is about 150 cm^2. The apparatus is provided with electrodes for measuring the electrolytic conductivity of the absorbing liquid. It can be used in the determination of carbon dioxide in air by means of conductometric titrations; visual titrations with air by means of thymolphthalein are also possible. No back-titration of the strontium hydroxide absorbent is needed. ***Ib Holm-Jensen.*** *Analytica Chimica Acta*, v. 23, no. 1, July 1960, p. 13-27.

12061* The Micro-Heterometric Determination of Platinum, Palladium and Gold With Papaverine. Reactions between papaverine and platinum(IV), palladium(II) or gold(III) in chloride, bromide, iodide and thiocyanate solutions, were studied heterometrically at pH values 1-9. Methods are presented for the determination of the metals (0.3-0.5 mg) singly or in mixtures. In mixtures, all three metals could be determined

directly from one or two titration curves. ***Mordechai Bobtelsky and Maurice Mosche Cohen.*** *Analytica Chimica Acta*, v. 23, no. 1, July 1960, p. 42-56.

12062* Polarographic Determination of Traces of Europium in Minerals and Ores. Method for the determination of as little as 10-12 p.p.m. of Eu. After lead separation, the total rare earths are separated by conventional methods and the rare earth oxides are dissolved in hydrochloric acid. Europium gives a wave of 0.1 *M* ammonium chloride supporting electrolyte at −0.67 V *vs.* S.C.E. and there are no interferences. ***V. T. Athavale, R. G. Dhaneswar, and M. M. Mehta.*** *Analytica Chimica Acta*, v. 23, no. 1, July 1960, p. 71-73.

12063 Micron Probe Suppliers. Manufacturers of the instruments are: Cameca Co., France; Applied Research Laboratories, Inc., U.S.; Philips Electronic Instruments, U.S.; Cambridge Instruments Co., Ltd., England; Hitachi, Ltd., Japan; Elion Instruments, Inc., U.S.; Materials Analysis Co., U.S.; and Associated Electrical Industries, Ltd., England. *Analytical Chemistry*, v. 32, Aug. 1960, p. 30A + 6 pages.

12064 A Polarographic Study of Organic Peroxides. A polarographic study of organic peroxides was conducted in a nonaqueous electrolyte solution. Polarograms were observed for 23 commercial organic peroxide compounds having the following functional peroxide groups: hydroperoxides, peroxy acids, peroxyesters, six-membered bicyclic peroxides, diacyl peroxides, and ketone peroxides. ***E. J. Kuta and F. W. Ouackenbush.*** *Analytical Chemistry*, v. 32, Aug. 1960, p. 1069-1072.

12065 Liquid-Liquid Extraction of Uranium and Plutonium From Acetate Solution With Triiso-octylamine. Separation From Thorium and Fission Products. Technique may be used for either tracer or macro quantities of U. Several practical applications of the method in radiochemical analysis and purifications are proposed. ***F. L. Moore.*** *Analytical Chemistry*, v. 32, Aug. 1960, p. 1075-1079.

12066 Spectrophotometric Determination of Small Amounts of Uranium With 8-Quinolinol. ***Kenji Motojima, Hiroyuki Yoshida, and Kimie Izawa.*** *Analytical Chemistry*, v. 32, Aug. 1960, p. 1083-1085.

12067 Sensitive Spot Test for Nitrogen Compounds in Petroleum Fractions. Nitrogen content rapidly estimated by visual comparison of colored spots produced by the reaction of nitrogen-containing compounds and tetracyanoethylene on filter paper. ***Paul V. Peurifoy and Maxwell Nager.*** *Analytical Chemistry*, v. 32, Aug. 1960, p. 1135-1137.

12068* Determination of Hydrogen by the Carrier Gas Method. The advantages of the carrier-gas method, the diffusion of H through Pd, the construction of the apparatus and devices, the degasification of samples are discussed. (*In German.*) Die Bestimmung von Wasserstoff im Stahl nach dem Trägergasverfahren. ***Karl Abresch, Walter Dobner, and Helmut Lemm.*** *Archiv für das Eisenhüttenwesen*, v. 31, no. 6, June 1960, p. 351-354.

12069* Determination of Amino Acids as Phenyl Thiohydantoin Derivatives. III. Quantitative Determination of 3-Phenyl-2-Thiohydantoins From Paper Chromatograms. ***John Sjöquist.*** *Biochimica et Biophysica Acta*, v. 41, no. 1, June 17, 1960, p. 20-30.

12070* A Micromethod for the Determination of Sulphate by Flame Photometry. Micromethod for the determination of 0.1 to 3.5 μg of sulfate. Estimations on microgram quantities of some organic and inorganic sulfur-containing compounds are given. ***G. A. Robinson.*** *Canadian Journal of Biochemistry and Physiology*, v. 38, July 1960, p. 643-648.

12071* The Presence of Monothiocarbonate Substituents in Cellulose Xanthates. Presence of monothiocarbonate substituents demonstrated by the infrared spectra of the gases evolved during the acid hydrolysis of cellulose xanthate salts and viscose. A comparison was made of the results of various methods of S determination and results obtained by ultraviolet spectroscopy. ***D. A. Andrews, F. G. Hurtubise, and H. Krässig.*** *Canadian Journal of Chemistry*, v. 38, Aug. 1960, p. 1381-1394.

12072* Spectrophotometric Quantitative Determination of Selenium Traces in Steels. The method proposed permits the quantitative determination of Se in the presence of Mn, Ni, Cr, Mo, V, P, and S, whatever their contents. The presence of Si, W, Zr, Nb and Ta requires the preliminary application of a complexing agent. (*In French.*) Dosage spectrophotométrique de traces de sélénium dans les aciers. ***N. Léontovitch.*** *Chimie Analytique*, v. 42, July 1960, p. 329-335.

12073* X-Ray Spectroscopy in the Clinical Laboratory. II. Chlorine and Sulfur; Automatic Analysis of Ultramicro Samples. ***Samuel Natelson and Bertrum Sheid.*** *Clinical Chemistry*, v. 6, no. 4, Aug. 1960, p. 299-313.

12074 Automatic Scanner Device for the Determination of ^{14}C on Paper Chromatograms. An apparatus able to detect and record the activity from ^{14}C labeled compounds on chromatographic paper strips. The least detectable activity is 4×10^{-4} μc. For activities ranging from 4×10^{-4} to 6×10^{-2} μc, a relation was found between the activity of the spots and the area of the corresponding peaks on the recording paper. ***M. Dubini and R. Fanteschi.*** *Italy, Comitato Nazionale per le Ricerche Nucleari, CNI*-32, May 1960, 12 pp. (QC770 It1.2ci Contin.)

12075* Thin Layer Chromatography of Weakly Polar Steroids. Cholesterol esters and 3β-acetoxy-steroid ketones can be separated by thin layer chromatography in a short time. Neutral fractions of oxidation products from side chain degradations of cholesteryl acetate were separated into more than 20 constituents and some of these could be determined semiquantitatively. This method gives rapid and good separations. ***M. J. D. Van Dam, G. J. De Kleuver, and J. G. De Heus.*** *Journal of Chromatography*, v. 4, no. 1, July 1960, p. 26-33.

12076* The Separation of the Long Chain Fatty Aldehydes by Gas-Liquid Chromatography. ***G. M. Gray.*** *Journal of Chromatography*, v. 4, no. 1, July 1960, p. 52-59.

12077* Separation of Some Rare Earths by Reversed-Phase Partition Chromatography. Separations accomplished: Ce-Nd-Pm, Ce-Pm-Sm-Eu-Gd-Tb, and Eu-Tb-Y using HNO_3 as the eluting agent. ***S. Siekierski and I. Fidelis.*** *Journal of Chromatography*, v. 4, no. 1, July 1960, p. 60-64.

12078* Chromatography on Paper Impregnated With Inorganic Ion-Exchangers. Papers impregnated with zirconium phosphate and zirconium molybdate were used for the separation of Ca, Sr, and Ba. ***J. M. Peixoto Cabral.*** *Journal of Chromatography*, v. 4, no. 1, July 1960, p. 86-87.

12079* Chromatography of Nucleic Acids on Cellulose Ion-Exchange Adsorbents. I. The Effect of the Degree of Substitution of the Cellulose on the Chromatographic Profile. Effect of the degree of substitution of ECTEOLA cellulose ion exchange adsorbents on the elution profile obtained during chromatography of heterogeneous mixtures of either DNA or RNA. ***Darrell N. Ward and Joseph D. Putch.*** *Makromolekulare Chemie*, v. 38, June 1960, p. 230-243.

12080 Gas Liquid Chromatography of Conjugated Fatty Acids. Effect of isomerization on the behavior of polyunsaturated fatty acids in gas liquid chromatography was studied in relation to linoleic and linolenic acids as found in wheat flour oil. ***N. W. R. Daniels and J. Wendy Richmond.*** *Nature*, v. 187, July 2, 1960, p. 55-56.

12081* Problems in Analyzing Inoculated Cast Irons. A study of the three large groups of problems is connected with this analysis; determination by sampling of C, graphite and S, determination of the remaining modifiers Mg, Ca, B, and Al, and determination of the composition of the substances used for the modification: Si, Fe, Al, Cu, Mg, electron metal, CaSi, and ferroboron. (*In Hungarian.*) Módosított öntöttvasak elemzési problémái. ***Pál Répás.*** *Öntöde*, v. 11, no. 6, June 1960, p. 138-142.

12082* Acid Anilides. VII. Quantitative Analysis of Fatty Acids by Paper Chromatography of Their Anilides. ***A. P. De Jonge and A. Verhage.*** *Recueil des Travaux Chimiques des Pays-Bas*, v. 79, July 1960, p. 761-770.

12083* Chromatographic Separation of Niacin and Its Derivatives on a Preparative Scale Using the Chromax Column. In sample mixtures containing 500-1500 mg each of niacin and niacinamide, high-recovery and complete separation were obtained. The purity of the fractions collected was determined by bioautographic tests and found to be very high. ***Curt Ovenfors.*** *Science Tools*, v. 7, no. 1, Apr. 1960, p. 1-4.

12084* Analysis of Acrylonitrile Copolymers by Infra-Red Spectrophotometry. The differentiation of the copolymers of acrylonitrile-acrylic acid, of acrylonitrile-acrylate, or of methyl methacrylate by infrared spectrophotometry implies a knowledge of the mutual actions of the functional groups. The tinctorial properties of polyacrylonitrile fibers can be improved considerably by distributing acid or ester functions in small proportions in the macromolecular chain, but characterization of the polymers obtained raises analytical difficulties that are hard to overcome. (*In French.*) Analyse des copolymères d'acrylonitrile par spectrophométrie infra-rouge. ***C. Gentilhomme, A. Piguet, J. Rosset, and Ch. Eyraud.*** *Société Chimique de France, Bulletin*, 1960, no. 5, May, p. 901-906.

12085* A Paper Chromatographic Method for Volatile Acids. Chromatographic method for detecting volatile acids in anaerobic digesters at 600 mg/1. Method also shows the presence of propionic and butyric acids when they occur along with acetic. ***A. M. Buswell, John R. Boring, III, and James R. Milam.*** *Water Pollution Control Federation, Journal*, v. 32, July 1960, p. 721-727.

12086* Photometric Determination of Tetracyclene on the Basis of Its Complexes Formed With Ammonium Molybdate. Tetracyclene, oxytetracyclene, and tetracyclene chloride, in a hydrochloric solution of p_H[1] in the presence of 50% ethanol per volume with ammonium molybdate, give a blue complex compound usable for the colorimetric determination of tetracyclene in a concentration range of 0.025 to 0.4 mg/ml. The method also permits tetracyclene determination in ferment evaluations. (*In German.*) Photometrische Bestimmung der Tetracycline auf Grund ihrer mit Ammoniummolybdat gebildeten Komplexe. ***L. Mázor and M. Pápay.*** *Zeitschrift für Analytische Chemie*, v. 175, no. 5, 1960, p. 355-359.

12087* Determination of Some Microadmixtures in Selenium of High Purity Communication. III. A radioactivation method for determining microquantities of Ag, Hg, Co, Cr, Ca, and In in Se was developed. The accuracy of the determination of individual elements is 10–30%. (*In Russian.*) Opredelenie nekotorykh mikroprimeseĭ v selene vysokoĭ stepeni chistoty. Soobshchenie. III. ***O. E. Zviagintsev and V. I. Shamaev.*** *Zhurnal Analiticheskoĭ Khimīi*, v. 15, no. 3, May-June 1960, p. 325-328.

See also: **12416** (monitoring fluoride level).

CHEMISTRY—INORGANIC AND GENERAL

12088* Borides of Rhenium and the Platinum Metals. The Crystal Structure of Re_7B_3, ReB_3, Rh_7B_3, $RhB{\sim}_{1.1}$, $IrB{\sim}_{1.1}$ and PtB. ***B. Aronsson, E. Stenberg, and J. Åselius.*** *Acta Chemica Scandinavica*, v. 14, no. 3, 1960, p. 733-741.

12089 Physico-Chemical Background of Phosphoric Acid Manufacture by Wet Processes. (With Special Reference to the Semihydrate Method.) ***Sven-Eric Dahlgren.*** *Acta Polytechnica Scandinavica, Chemistry Including Metallurgy Series No.* 7, 1960, 15 pp. (T1 Ac81c Vis.)

12090 Advances in Inorganic Chemistry and Radiochemistry. Stereochemistry of ionic solids, organometallic compounds, fluorine-containing compounds of sulfur, amides and imides of the oxyacids of sulfur, halides of the actinide elements, structures of compounds containing chains of sulfur atoms, chemical reactivity of the boron hydrides and related compounds, and mass spectrometry in nuclear chemistry. ***H. J. Emeléus and A. G. Sharpe, editors.*** v. II. 392 pp. 1960. Academic Press, New York. (QD1 Ad95 Vis.)

12091 The Reactions of Recoil Tritium With Gaseous Hydrocarbons. Recoil tritium reactions with *trans*-butene-2, *cis*-butene-2, isobutylene, propylene and propane under a variety of experimental conditions. Presents a general hypothesis for recoil tritium reactions as saturated and unsaturated carbon atoms. ***J. K. Lee, Burdon Musgrave, and F. S. Rowland.*** *American Chemical Society, Journal*, v. 82, July 20, 1960, p. 3545-3552.

12092* Studies on Phosphorus Oxychloride and Aluminium Chloride Complex. Molar ratio of aluminum chloride and phosphorus oxychloride in the complex formed was 1:2. Investigation was undertaken to throw more light on the composition of the complex and also to study its physico-chemical properties, such as its cryoscopic behavior, electrical conductivity and absorption spectra in solution. ***K. N. Venkataraman and A. R. Vasudeva Murthy.*** *Indian Academy of Sciences, Proceedings*, v. 51, sec. A, no. 5, May 1960, p. 270-279.

12093 Copper(O) Phthalocyanine. Reduction of copper(II) phthalocyanine with K in liquid ammonia yields an anionic phthalocyanine complex of Cu in the zero oxidation state. Evidence is presented for the possible intermediation of copper(I) phthalocyanine and its disproportionation. ***G. W. Watt and J. W. Dawes.*** *Journal of Inorganic and Nuclear Chemistry*, v. 14, nos. 1-2, July 1960, p. 32-34.

12094 The Precipitation of Ruthenium From Nitrate Solutions With Inorganic and Organic Sulphides. β-mercaptopropionic acid and 2-3 dimercaptopropanol-1 (BAL) were found to be very effective reagents for precipitating Ru from nitric acid solution. The presence in the organic molecule of one or more—SH groups is essential. ***R. L. Moore.*** *Journal of Inorganic and Nuclear Chemistry*, v. 14, nos. 1-2, July 1960, p. 38-41.

12095 The Preparation of 9-Tungstoberyllic Acid. ***D. H. Brown.*** *Journal of Inorganic and Nuclear Chemistry*, v. 14, nos. 1-2, July 1960, p. 129-132.

12096 The Silicon-Boron System. Liquidus curve and structure of SiB_4. ***Cyrill Brosset and Bengt Magnusson.*** *Nature*, v. 187, July 2, 1960, p. 54-55.

12097 Principles of Chemistry. College text which emphasizes the quantitative aspects of modern general chemistry. The text is divided into two major parts: properties of chemical substances and dynamics of chemical change. ***Lejaren A. Hiller, Jr. and Rolfe H. Herber.*** 735 pp. 1960. McGraw-Hill, New York. (QD31 H55p)

12098 Reinhold Physical and Inorganic Chemistry Textbook Series. Chemical Periodicity. Fundamental basis of the periodic law, chemical combination, condition of combined atoms, principles of coordination chemistry, physical nature of the elements, binary compounds of O, H, N, S, F, C, B, I, methyl, ethyl, and phenyl compounds of the elements and inner transition elements. ***R. T. Sanderson.*** 330 pp. 1960. Reinhold Publishing, New York. (QD467 Sa56c)

12099* The Dehydration Properties of Some Hydrated Rare Earth Oxalates, and the Exceptional Behaviour of Cerium (III) Oxalate. Rare earth oxalates may be dehydrated at 320° *in vacuo* without decomposition. In air, cerium (III) oxalate is converted at this temperature into cerium dioxide. None of the other rare earth oxalates behave in this manner. The exceptional behavior of cerium (III) oxalate as well as the similar behavior of plutonium (III) and americium (III) oxalates, are attributed to the susceptibility of these trivalent cations to oxidation to the quadrivalent state. ***A. Glasner and M. Steinberg.*** *Research Council of Israel, Bulletin*, v. 8A, no. 4, Dec. 1959, p. 174-178.

12100* A Comparative Study of Ion-Exchange Equilibria in Triphosphate and Copper Triphosphate Solutions. Two anion exchangers, one of low water regain and the other of high water regain, were used in order to study the sorption of triphosphate ions and copper-triphosphate complexes from the corresponding solutions. Triphosphate ion is sorbed with an average charge of 4.4 or 3.8 according to the initial ion on the exchanger. ***Carla Heitner-Wirguin.*** *Research Council of Israel, Bulletin*, v. 9A, nos. 1-2, Apr. 1960, p. 37-42.

12101 Research on a New Class of Inorganic Molecules Consisting Basically of Sulfur and Nitrogen. Silicon amines were found to react with either S_2Cl_2 or SCl_2. NH_2CN, $CO(NH_2)_2$ and $CO(NHCH_3)_2$ were found to react with S_2Cl_2 to give complex polymeric materials. S_4N_4 was found to react violently with $C_6H_5PCl_2$ at room temperature to give high yields of the linear phenyl phosphonitrilic chloride oligomer, $(C_6H_5PNCl)_4.C_6H_5PCl_4$. S_4N_4 was found to react with anhydrous HBr and HF at room temperature, to produce, in the former case, a mixture of S_4N_3Br and NH_4Br. S_4N_3Cl was found to react with a number of amines to give semi-solid viscous materials. ***M. E. Cohen, R. A. Kent, A. G. MacDiarmid, and N. H. Marcantonio.*** *U. S. Air Force, Wright Air Development Division, WADD Technical Report* 60-169, Apr. 1960, 17 pp. (TL507 Un3.18w Vis.)

12102 Decomposition of Nitrous Oxide. Final Report. Catalytic decomposition of dilute nitrous oxide gas under varying temperature and space velocity. ***J. H. Zufall and H. S. Miller.*** *U. S. Atomic Energy Commission, IDO*-14513, July 1, 1960, 19 pp. (UF767 Un3.1id Contin.)

12103* Hexachlorogermanates of Alkali Metals. The conditions to obtain Cs hexachlorogermanates were studied. Rubidium and tetramethylammonium hexachlorogermanates were obtained. Other alkali metals and hydrochloride salts do not form a series of amines of hexachlorogermanates. (*In Russian.*) Geksakhlorogermanaty shchelochnykh metallov. ***V. V. Udovenko and Iu. Ia. Failkov.*** *Zhurnal Neorganicheskoĭ Khimii*, v. 5, no. 7, July 1960, p. 1502-1504.

CHEMISTRY—ORGANIC

12104 Advances in Organic Chemistry. Methods and Results. Contains information on the Kolbe electrolytic synthesis, polyphosphoric acid as a reagent in organic chemistry, Wittig reaction, hydoxylation methods, selective degradation of proteins, and optical rotatory dispersion and study of organic structures. ***Ralph A. Raphael, Edward C. Taylor, and Hans Wynberg, editors.*** v. I. 387 pp. 1960. Interscience Publishers, New York. (QD241 Ad95)

12105 *t*-Butyl Esters of Amino Acids and Peptides and Their Use in Peptide Synthesis. Synthesis by acid-catalyzed reaction of isobutylene with benzyloxycarbonylamino acids or peptides followed by catalytic hydrogenation to produce the basic esters. Another general method entailed the use of silver salts and *t*-butyl iodide. *t*-Butyl esters are particularly useful in peptide synthesis in that the ester group may be removed by acid catalysis and thus side reactions encountered in alkaline hydrolysis may be avoided. Other advantages arise from the stability of amino acid or peptide esters as free bases, particularly in allowing their storage and use as such. Comparative stabilities to ethyl esters are reported in several examples. ***George W. Anderson and Francis M. Callahan.*** *American Chemical Society, Journal*, v. 82, July 5, 1960, p. 3359-3363.

12106 The Isolation of an Octulose and an Octitol From Natural Sources: D-*glycero*-D-*manno*-Octulose and D-*erythro*-D-*galacto*-Octitol From the Avocado and D-*glycero*-D-*manno*-Octulose From *Sedum* Species. ***A. J. Charlson and Nelson K. Richtmyer.*** *American Chemical Society, Journal*, v. 82, July 5, 1960, p. 3428-3434.

12107 Totally Synthetic Penicillins. Nine new penicillin analogs synthesized totally in multigram quantities from *t*-butyl 4-carbobenzyloxy-5,5-dimethyl-α-amino-2-thiazolidineacetate hydrochloride. Reaction of this amine with various chloroformates, sulfonyl chlorides, isocyanates, a carbamyl chloride, a sulfamyl chloride and dinitrofluorobenzene produced the corresponding substitution products. Most of these products then satisfactorily underwent successive hydrohalogenolysis of the *t*-butyl ester, β-lactam cyclization with thionyl chloride and catalytic hydrogenolysis of the benzyl ester to yield the new penicillin analogs which were isolated as crystalline N-ethylpiperidine salts. ***William A. Bolhofer, John C. Sheehan, and Esther L. A. Abrams.*** *American Chemical Society, Journal*, v. 82, July 5, 1960, p. 3437-3441.

12108 Lithium Aluminum Amides as Catalysts for the Reaction of Lithium Aluminum Hydride With 1-Hexyne. Catalysts for this reaction were produced by the reaction of excess lithium aluminum hydride in ether on amines and related compounds. ***George B. Smith, Darl H. McDaniel, Edward Biehl, and C. A. Hollingsworth.*** *American Chemical Society, Journal*, v. 82, July 20, 1960, p. 3560-3562.

12109 The Total Synthesis of Chlorophyll. ***R. B. Woodward, et al.*** *American Chemical Society, Journal*, v. 82, July 20, 1960, p. 3800-3802.

12110* Relative Esterifiability of the Primary and Secondary Hydroxyl Groups of Glycerol. ***J. D. Brandner and R. L. Birkmeier.*** *American Oil Chemists' Society, Journal*, v. 37, Aug. 1960, p. 390-396.

12111* Malonaldehyde Production During the Controlled Oxidation of Pure, Unsaturated Fatty Acids. Measures quantitatively the production of malonaldehyde during the controlled oxidation of pure, unsaturated fatty acids and correlates it with their off-odor. Reports adsorption at 450 mμ, obtained when the oxidation products of the fatty acids are reacted with TBA. ***Basil G. Tarladgis and Betty M. Watts.*** *American Oil Chemists' Society, Journal*, v. 37, Aug. 1960, p. 403-406.

12112* Addition Compounds of Titanium. Reaction of titanium tetrachloride, chlorotitanium alkoxides, and titanium tetra-alkoxides with ammonia and pyridine. Solid, stable, addition complexes are formed; these react further with alcohols to give the fully substituted ester. In some of the ammonia complexes, Ti exhibits covalencies five and six. ***P. Dunn.*** *Australian Journal of Chemistry*, v. 13, no. 2, May 1960, p. 225-229.

12113* An Infra-Red Study of the Association of Diazoaminobenzene. Infrared spectrum of diazoaminobenzene reveals that dimeric association occurs through H bonding. Effects of various solvents on the free N—H stretching frequency were examined. A linear relation of this type is also found for 2-nitroaniline, and confirms that there is no significant intramolecular H-bonding in this compound. ***L. K. Dyall.*** *Australian Journal of Chemistry*, v. 13, no. 2, May 1960, p. 230-235.

12114* The Thermal Decomposition of Phenylacetic Acid. Thermal decomposition investigated by the toluene-carrier technique over the temperature range 587-722 C. Products of the pyrolysis were determined. ***Margaret H. Back and A. H. Sehon.*** *Canadian Journal of Chemistry*, v. 38, Aug. 1960, p. 1261-1270.

12115* The Thermal Decomposition of Diphenylacetic Acid. ***Margaret H. Back and A. H. Sehon.*** *Canadian Journal of Chemistry*, v. 38, Aug. 1960, p. 1271-1276.

12116* Co-Ordination Complexes of Titanium (IV) Halides. I. Preparation and Infrared Spectra of the Complexes of Titanium (IV) Halides With N,N-Dimethyl and N,N-Diphenyl Formamide. ***Jacques Archambault and Roland Rivest.*** *Canadian Journal of Chemistry*, v. 38, Aug. 1960, p. 1331-1338.

12117 Fluorocarbons Growth Spurred as Competition Gets Keener. Applications for fluorocarbons are presented. *Chemical and Engineering News*, v. 38, no. 29, July 18, 1960, p. 92 + 7 pages.

12118 The Preparation, Reactions, and Properties of Triphenylenes. Reviews triphenylene and its hydrogenated and univalently substituted derivatives. Chemistry of the keto-substituted hydrotriphenylenes is also covered. ***Charles M. Buess and D. David Lawson.*** *Chemical Reviews*, v. 60, no. 4, Aug. 1960, p. 313-330.

12119 Ditertiary Phosphine Complexes of Molybdenum(O). Molybdenum complexes obtained by the replacement of benzene from dibenzene-molydenum by the ditertiary phosphines. ***J. Chatt and H. R. Watson.*** *Chemical Society, Proceedings*, 1960, July, p. 243.

12120 The Chemistry of Natural Products. The Carbohydrates. General reactions, configuration, and ring structures of the monosaccharides; derivatives of the monosaccharides; less common naturally occurring sugars; plant glycosides; oligosaccharides; polysaccharides; and carbohydrate metabolism. ***S. F. Dyke.*** v. V. 232 pp. 1960. Interscience Publishers, New York. (QD321 D99c)

12121 The Chemistry of Natural Products. The Natural Pigments. Pyran, pyrrole, pyrimidine, quinonoid, and polyene pigments. ***K. W. Bentley.*** v. IV. 306 pp. 1960. Interscience Publishers, New York. (QP671 B44n)

12122 Comparative Biochemistry. Free Energy and Biological Function. A comprehensive treatise. ***Marcel Florkin and Howard S. Mason, editors.*** v. II. 685 pp. 1960. Academic Press, New York. (QP514 F66c)

12123 Alkylation of Benzene and Toluene. Low-temperature operation gives fair yields of intact alkylate from tri- and tetraisobutylene. ***R. A. Sanford, S. M. Kovach, and B. S. Friedman.*** *Industrial and Engineering Chemistry,* v. 52, Aug. 1960, p. 679-680.

12124 Nitration Studies. XII. Nitrohalogenation of Negatively Substituted Olefins With Mixtures of Dinitrogen Tetroxide and Halogens. Mixtures of dinitrogen tetroxide and halogens react with olefins to produce compounds with a halogen atom on one carbon atom and a nitrogen-containing group on the other carbon atom of the original double bond. ***G. Bryant Bachman, Teă J. Logan, Kenneth R. Hill, and Norman W. Standish.*** *Journal of Organic Chemistry,* v. 25, Aug. 1960, p. 1312-1322.

12125 Reductive Dimerization in Formic Acid. Formation of 1,1,3,3-tetrakis(*p*-dimethylaminophenyl)butane (VII) by the action of formic acid on 1,1-bis(*p*-dimethylaminophenyl)-ethylene. ***Earle Van Heyningen and Donald R. Cassady.*** *Journal of Organic Chemistry,* v. 25, Aug. 1960, p. 1325-1328.

12126 Thiazolethiols and Their Derivatives. Ammonium dithiocarbamate and ethyl bromopyruvate reacted to give ethyl 2-mercapto-4-thiazolecarboxylate. Saponification gave 2-mercapto-4-thiazolecarboxylic acid. Thirty-four derivatives and related thiazolethiols were prepared. ***John J. D'Amico and Thomas W. Bartram.*** *Journal of Organic Chemistry,* v. 25, Aug. 1960, p. 1336-1342.

12127 Medicinal Chemistry. ***Alfred Burger, editor.*** 2nd Ed. 1243 pp. 1960. Interscience Publishers, New York. (RS403 B91m2)

12128* The Degradation of Toluene-^{14}C. Method of degradation which makes it possible to determine the specific activity of each of the ring carbon atoms. ***H. Steinberg and F. L. J. Sixma.*** *Recueil des Travaux Chimiques des Pays-Bas,* v. 79, July 1960, p. 679-687.

12129* A Simple Preparation of Phthaloyl Amino Acids Via a Mild Phthaloylation. Phthaloyl amino acids were synthesized from N-carboethoxy phthalimide and amino acid salts under very mild conditions in water. ***G. H. L. Nefkens, G. I. Tesser, and R. J. F. Nivard.*** *Recueil des Travaux Chimiques des Pays-Bas,* v. 79, July 1960, p. 688-698.

12130* Investigations on Sterols. XV. The Syntheses and Properties of 9β, 10α-Progesterone and 6-Dehydro-9β, 10α-Progesterone. XVI. The Syntheses and Properties of 9β, 10α-Androstanes. ***P. Westerhof and E. H. Reerink.*** *Recueil des Travaux Chimiques des Pays-Bas,* v. 79, July 1960, XV. p. 771-783; XVI. 794-806.

12131* The Organo Element Institute, Moscow. Plastics-Rubber Research in the Soviet Union. Work is being conducted on organo-metal, phosphorus, and organo-silicon compounds. *Rubber Journal and International Plastics,* v. 139, no. 2, July 9, 1960, p. 54-55.

12132 Synthetic Methods of Organic Chemistry. Gives new methods for the synthesis of organic compounds, improvements of known methods, and also old proved methods from periodicals. ***W. Theilheimer.*** v. XIV. 534 pp. 1960. Interscience Publishers, New York. (QD262 T34str Vis.)

12133* The Reaction of Ozone With Organic Hydroperoxides. ***D. Barnard, G. P. McSweeney, and J. F. Smith.*** *Tetrahedron Letters,* 1960, no. 14, June, p. 1-4.

12134* Complex Compounds of Bivalent Platinum With 1.7-Aminoenenthylic Acid. Trans-[Pt$\left\{NH_2(CH_2)_6CO_2H\right\}_2$-$Cl_2$] and trans-[Pt$\left\{NH_2(CH_2)_6CO_2\right\}_2(NH_3)_2$] were synthesized. The Jörgensen separation of trans-[Pt$\left\{NH_2(CH_2)_6CO_2\right\}_2(NH_3)_2$ results in a very low yield of trans-[Pt-$(NH_3)_2Cl_2$](not more than 20%). (*In Russian.*) Kompleksnye soedineniia dvukhvalentnoi platiny s 1.7-aminoenantovoi kislotoi. ***L. M. Volshtein and M. F. Mogilevkina.*** *Zhurnal Neorganicheskoĭ Khimii,* v. 5, no. 7, July 1960, p. 1445-1448.

See also: **11964** (review of biochemistry); **11996** (diphenylpropylamines); **12049** (fatty acids and fatty alcohols); **12382** (propellant chemistry).

CHEMISTRY—PHYSICAL

12135* Kinetics and Mechanism of the Interaction of Ethyl Radicals With Molecular Oxygen. II. Relationship Between the Kinetics of the Reaction and the Third Particle. The dependence of the velocity constant of recombination of ethyl radicals upon pressure was investigated. The recombination occurs according to the law of the trimolecular reactions. The absolute value of the constant was determined. The dependence upon pressure was studied between 1 and 13 mm of the Hg column of the effective constant of velocity of the reaction of ethyl radicals with a molecular O. (*In Russian.*) Kinetika i mekhanizm vzaimodeĭstviia etil'nykh radikalov s molekuliarnym kislorodom. Soobshchenie II. Zavisimost' kinetiki reaktsii ot tret'eĭ chastitsy. ***L. I. Avramenko and R. V. Kolesnikova.*** *Akademiia Nauk SSSR, Izvestiia, Otdelenie Khimicheskikh Nauk,* 1960, no. 6, June, p. 989-995.

12136 The Phosphorescence of Adsorbed Acriflavine. Systematic study of the phosphorescence of acriflavine–silica gel adsorbates. ***Jerome L. Rosenberg and Donald J. Shombert.*** *American Chemical Society, Journal,* v. 82, July 5, 1960, p. 3252-3257.

12137 The Effect of Substitution on the Ionization Potentials of Free Radicals and Molecules. I. A New Set of Constants, the δ_K Values. New applications of ionization potentials using substituted amines as a standard, a new set of constants; δ_K values were calculated. ***Joyce J. Kaufman and W. S. Koski.*** *American Chemical Society, Journal,* v. 82, July 5, 1960, p. 3262-3268.

12138* Quinoxalinium Compounds. Quinoxalinium salts resemble triphenylmethane closely. The dimethylamino derivatives are blue in solution, like malachite green. The dihydroxyphenyl derivative is orange-red as aurin. The protolysis constants of the former are of the same order of magnitude as trityl compounds. Under the effects of metals, non-aqueous quinoxalinium salt solutions become red-brown and react as if they contained free radicals. (*In German.*) Über Chinoxalinium-Verbindungene. ***Sven Bodforss.*** *Annalen der Chemie (Justus Liebigs),* v. 633, nos. 1-3, 1960, p. 66-67.

12139* Kinetics of the Vapor-Phase Oxidation of Naphthalene Over a Vanadium Catalyst. Rates of oxidation of naphthalene were measured for the temperature range 300 C to 335 C using a thin layer of vanadium oxide-potassium sulfate-silica catalyst in a flow reactor. Results suggested that the reaction course consisted of two parallel, consecutive reactions in which 1,4- and 1,2-naphthoquinone are intermediates in the formation of phthalic anhydride. ***K. A. Shelstad, J. Downie, and W. F. Graydon.*** *Canadian Journal of Chemical Engineering,* v. 38, no. 4, Aug. 1960, p. 102-107.

12140* The Sulphuric Acid Solvent System. I. Acid-Base Reactions. Studies reactions by electrical conductivity measurements. A relation between the composition at which the conductivity has a minimum value and the strengths of the acid and base are derived. Values of the dissociation constants of acids and bases obtained in this way are shown to be in good agreement with values obtained by other methods. ***R. H. Flowers, R. J. Gillespie, and E. A. Robinson.*** *Canadian Journal of Chemistry,* v. 38, Aug. 1960, p. 1363-1370.

12141* Coprecipitation of Traces of Inorganic Admixtures. Coprecipitation was studied in relation to isomorphous admixtures in microconcentration, abnormal mixed crystals, internal adsorption, homogeneous solution, organic acid salts,

complex compounds and complex salts, "indifferent" coprecipitants and constituents of colloidal solutions. (*In Czech.*) Spolusrážení anorganických Příměsí v mikrokoncentracích. ***Miroslav Kyrš and Miloslav Křivánek.*** *Chemicke Listy*, v. 54, no. 7, July 1960, p. 667-679.

12142* Solubility of Acetylene in Benzene, Toluene and *p*-Xylene. The solubility of acetylene was determined in a wide range of temperature by means of the saturation method. Experimental data were expressed by means of the Bunsen absorption coefficients. The solubility parameter of acetylene was calculated and validity of the solubility theory of Hildebrand was verified in the systems mentioned. (*In German.*) Loslichkeit des Acetylens in Benzol, Toluol und *p*-Xylol. ***J. Vítovec and V. Fried.*** *Collection of Czechoslovak Chemical Communications*, v. 25, no. 6, June 1960, p. 1552-1556.

12143* Adsorption From Solutions of the Nonelectrolytes on Solid Adsorbents. I. General Relationships and Extremely Simple Model. On the basis of thermodynamic conditions for the balance in a system subjected to the action of a field of forces, a basic and generally valid equation was derived for the adsorption from binary solutions on a solid adsorbent. The equation was simplified on the basis of assumptions concerning the field of forces of the adsorbent and behavior of solutions in an adsorbed layer. The form of the adsorption isotherms corresponding to the simplest model of the adsorption system was found. (*In German.*) Adsorption Aus Lösungen der Nichtelektrolyten an Festen Adsorbentien. I. Allgemeine Beziehungen und Einfachstes Modell. ***M. Šiškovà and E. Erdös.*** *Collection of Czechoslovak Chemical Communications*, v. 25, no. 7, July 1960, p. 1729-1735.

12144 Dissociation Energies of the Gaseous Mono-Halides of Boron, Aluminium, Gallium, Indium and Thallium. Considers thermochemical and spectroscopic evidence about the group of halide molecules from BF to TlI, and proposes values of the dissociation energy. ***R. F. Barrow.*** *Faraday Society, Transactions*, v. 56, July 1960, p. 952-958.

12145 Decomposition Rates of Trans-Dimeric C-Nitroso Compounds in Solution. Kinetic studies are carried out for a variety of primary and secondary alkyl, aralkyl and cycloaliphatic nitroso-compounds in ethanol and for R = $C_6H_5CH_2$ in carbon tetrachloride and cyclohexane. ***L. Batt and B. G. Gowenlock.*** *Faraday Society, Transactions*, v. 56, July 1960, p. 1022-1027.

12146 Effects of Recrystallization and Storage on the Thermal Decomposition of Potassium Permanganate. Thermal decomposition kinetics measured at 221 C, with special precautions to avoid self-heating. An equation for estimating self-heating is given. The reaction-time curves were analyzed by differentiation. ***R. A. W. Hill and J. N. Welsh.*** *Faraday Society, Transactions*, v. 56, July 1960, p. 1059-1066.

12147 Solvents of High Proton Availability. Kinetic studies in nonaqueous solvents such as sulfuric acid. In highly acidic solvents even the strong acids of aqueous systems become weak acids, the weaker acids become nonelectrolytes, and weak acids act as bases (proton acceptors). ***Martin Kilpatrick.*** *Journal of Chemical Education*, v. 37, Aug. 1960, p. 403-406.

12148 The Solubilities of Lanthanum Chloride 7-Hydrate and Lanthanum Chloride 6-Hydrate in Water, and a Study of the Thermal Decomposition of Hydrated Lanthanum Chloride. ***J. E. Powell and H. R. Burkholder.*** *Journal of Inorganic and Nuclear Chemistry*, v. 14, nos. 1-2, July 1960, p. 65-70.

12149 The Kinetics of the Reaction Between Plutonium(IV) and Vanadium(III) in Perchlorate Solution. Kinetics of the reduction studied as a function of temperature and acidity in perchlorate solutions of ionic strength two. The reaction rate was found to be first order with respect to each of the reactants and inversely proportional both to the first power and to the second power of the hydrogen ion concentration. ***S. W. Rabideau and R. J. Kline.*** *Journal of Inorganic and Nuclear Chemistry*, v. 14, nos. 1-2, July 1960, p. 91-97.

12150* Effects of the Composition of the Absorbent on the Velocity of Absorption of SO_2 From Gases. The dependency of the coefficient of mass transfer on the change of free chemical capacity and viscosity of the absorbent was determined on the pattern of SO_2 absorption from gases by sulfite-bisulfite of ammonium. (*In Russian.*) O vliianii sostava absorbenta na skorost' pogloshcheniia SO_2 iz gazov. ***B. A. Chertov.*** *Khimicheskaia Promyshlennost'*, 1960, no. 3, Apr.-May, p. 47-51.

12151* Studies of Natural and of Synthetic Fibers. V. Properties of Collagen Fibers: Isotropic Length of Dry Amorphous Fibers as a Function of the Number of Cross-Links in the Network, Introduced Into the Oriented Fibers. On differently tanned fibers, the retraction ratios L_t/L_e, the equilibrium swelling ratios in water at 85 C, and the concentrations of the cross-links were measured. From these measurements was calculated L_{to}/L_e, the retraction ratio in the dry state: the values of L_{to}/L_e were found to be proportional to the square root of the densities of the cross-links (for the highly tanned fibers) and are predicted by the theory. (*In French.*) Etudes sur les fibres naturelles et de synthèse. V. Propriétés des fibres de collagène: Longueur isotrope de fibres amorphes séches en fonction du nombre de liens intermoléculaires introduits dans les fibres orientées. ***Jean F. M. Oth.*** *Kolloid-Zeitschrift*, v. 171, no. 1, July 1960, p. 1-7.

12152* Photochemistry in the Liquid and Solid States. Based on some of the papers presented at a symposium held at Endicott House in Dedham, Mass., Sept. 3-7, 1957. Photochemical reactions, photosensitized reactions, fluorescence, kinetic considerations, role of the triplet state, photochemical reactions involving chlorophyll, and photoreactions in solids. ***Lawrence J. Heidt, Robert S. Livingston, and Eugene Rabinowitch, editors.*** 174 pp. 1960. John Wiley & Sons, New York. (QD601 Sy68p Over.)

12153 Electronic Structure and Binding Energy of Carbon Monoxide. Orbital calculation, intra-atomic correlation correction, analysis of the total wave function, dipole moment are discussed. ***A. C. Hurley.*** *Reviews of Modern Physics*, v. 32, no. 2, Apr. 1960, p. 400-411.

12154 Theory of Unimolecular Reactions. Development of theories of the rates of unimolecular reactions in gases. ***Noel B. Slater.*** 230 pp. 1959. Cornell University Press, Ithaca, N. Y. (QD501 SL15t)

12155 The Vaporization, Thermodynamics, and Phase Behavior of Uranium Monosulfide. ***E. David Cater.*** U. S. *Atomic Energy Commission, ANL*-6140, Mar. 1960, 178 pp. (UF767 Un3.1an Contin.)

12156 Low-Temperature Heat Capacities and Entropies at 298.15°K. of Strontium Sulfide and Barium Sulfide. Heat capacity measurements in the temperature range 50-298 K. The entropies at 298.15 K were derived from the heat capacity values. Free energies of formation at 298.15 K were computed from the entropies and literature values of the heats of formation. ***E. G. King and W. W. Weller.*** U. S. *Bureau of Mines Report of Investigations* 5590, 1960, 5 pp. (TN21 Un3r Room 290)

12157* Concerning Trimethylphosphine Oxide. The infrared-spectra from 650 to 4000 cm^{-1} in th solid and gaseous state and in the presence of water are reported. Changes in the PO-frequency are caused by strong association in the solid state and formation of hydrates, however, without changing of the P = O-double bond. These spectroscopic results were certified by the curve of vapor pressure. The P = O-bond acts similar to the C = O-bond. (*In German.*) Über Trimethylphosphinoxyd. ***J. Goubeau and W. Berger.*** *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 304, nos. 3-4, May 1960, p. 147-153.

12158* Surface Tension of Sulfuric Acid-Water Mixtures in a Temperature Range Between 15 and 25° C. Mixtures consisting of double distilled water and sulfuric acids of different degrees of purity were tested by the adhesion method with a hollow cylinder. The temperature coefficient of the surface tension was determined at 20 C. A critical comparison of the values obtained with those of other authors showed a maximum difference of 0.6%. (*In German.*) Die Oberflächenspannung von Schwefelsäure-Wasser-Gemischen im Temperaturbereich von 15 bis 25°C. ***W. Hoffmann and F. W. Seemann.*** *Zeitschrift für Physikalische Chemie* (Frankfurt), v. 24, nos. 5-6, June 1960, p. 300-306.

12159* The Effects of Substitutes of the Second Order on the Ultraviolet Spectra of Azulene. The UV-spectra of 39 nitroazulenes, acetyl azulenes, azulene aldehydes, azulene nitryls and azulene carbon esters were measured and discussed in connection with some literature data. For the introduction of each one of these substitutes, a characteristic wavelength deflection at the main maximum of azulene was detected. In the case of spatially arranged nitro-, acetyl- and carbon ester groups, a steric hindrance due to the neighboring alkyl groups was noted. (*In German.*) Der Einfluss von Substituenten 2. Ordnung auf die Ultraviolett-Spektren der Azulene. ***W. Treibs and R. Borsdorf.*** *Zeitschrift für Physikalische Chemie* (Leipzig), v. 214, nos. 3-4, 1960, p. 206-219.

12160* Radioactivation Method for Determining Beryllium in Mineral Raw Materials and Hydrometallurgy Products. A design of the installation and γ-source for determining Be by the radioactivation method is described. The influence of some effects distorting the results of the analysis (such as self-absorption of photoneutrons, absorption of γ-rays) is considered and recommendations are given as to the elimination of errors caused by these effects. (*In Russian.*) Radioaktivatsionnyĭ metod opredeleniia berilliia v mineral'nom syr'e i produktakh gidrometallurgii. ***Kh. B. Mezhiborskaia.*** *Zhurnal Analiticheskoĭ Khimii*, v. 15, no. 3, May-June 1960, p. 281-286.

12161* On a New Reagent for Lead. A study was made of the properties of arsenium-containing triazenes obtained for the first time. It was shown that 4″-nitrobenzene-1″, 4-diazoamino-1, 1′-azobenzene-2″-arsono-4′-sulfonic acid (sulfarsazen) can be successfully applied as a reagent for Pb. The maximum of optical density is observed at the molar ratio of Pb to the reagent being equal to 1. (*In Russian.*) O novom reagente na svinets. ***A. M. Lukin and G. S. Petrova.*** *Zhurnal Analiticheskoĭ Khimii*, v. 15, no. 3, May-June 1960, p. 295-298.

12162* Temperature of the Addition of Aniline and of Its Derivatives to Cobalt Chloride. Some aromatic amines added to anhydrous Co chloride were studied. The approximate heats of the addition of gaseous amines in the expanded lattice of Co chloride were calculated. The Co-N bond in these products of addition is rather covalent than ion-dipolar. (*In Russian.*) Teploty prisoedineniia anilini i ego proizvodnykh k khloristomu kobal'tu. ***A. V. Ablov, Ts. B. Konunova-Frid, and V. A. Palkin.*** *Zhurnal Neorganicheskoĭ Khimii*, v. 5, no. 7, July 1960, p. 1544-1550.

See also: **12045** (principles of chemical thermodynamics).

COATINGS

12163* Printing Ink Varnishes—Old and New. ***Edward Haines.*** *American Ink Maker*, v. 38, July 1960, p. 30 + 3 pages.

12164 Coatings for Non-Structural Surfaces. ***William Brushwell.*** *American Paint Journal*, v. 44, July 25, 1960, p. 79 + 6 pages.

12165 Coatings for Non-Structural Surfaces. Discusses water-soluble organic coatings. ***William Brushwell.*** *American Paint Journal*, v. 44, Aug. 8, 1960, p. 71 + 4 pages.

12166 Test Methods for the Water Vapour Permeability and Heat Reflectance of Pigmented Organic Coatings. ***Max Kronstein, Richard M. Sonshine, and Joseph A. Castronovo, Jr.*** *American Paint Journal*, v. 44, Aug. 15, 1960, p. 96 + 12 pages.

12167 Spray-Applied Vinyl Finishes on Metal. ***F. L. Scott.*** *Automotive Industries*, v. 123, no. 2, July 15, 1960, p. 114-116.

12168* Surface Treatment of Storage Tanks. "Weathering" before painting is recommended. *British Chemical Engineering*, v. 5, Aug. 1960, p. 576 + 1 page.

12169 How the Star Makes Top Quality Inks. II. ***David Judge.*** *Canadian Printer and Publisher*, v. 69, July 1960, p. 80-81.

12170 Ceramic Coatings for High Temperature Service. ***S. W. Bradstreet, Jr.*** *Corrosion*, v. 16, July 1960, p. 81-83.

12171 Coal Tar Creosote Studies. III. Distillation Residue Studies. ***T. R. Sweeney, T. R. Price, and S. M. Miller.*** *Corrosion*, v. 16, July 1960, p. 111-114.

12172* The Use of Epoxy Resins in Domestic Applicance Finishes. ***D. H. Colville.*** *Current Engineering Practice*, v. 2, no. 10, Apr. 1960, p. 35-36.

12173* Vapour Plating by Vacuum Evaporation. Outlines methods of producing thick vacuum deposits of Cd for protective applications on aircraft fittings, and consumer hardware; describes original work on corrosion resistance and adhesion of coatings. ***B. J. Williams.*** *Electroplating and Metal Finishing*, v. 13, July 1960, p. 247-251.

12174* Kinetic Studies During Autoxidation of Dehydrated Castor Oil. Explains film-forming properties of dehydrated castor oil with the help of kinetic measurements of the characteristic values with relationship to oxidation at various stages. (*In German.*) Kinetische Betrachtungen zur Autoxydation des Rizinenöles. ***J. Morgner.*** *Fette, Seifen, Anstrichmittel*, v. 62, no. 6, June 1960, p. 496-498.

12175* Flexographic Printing Tests. VI. Ink film property tests. *Flexography*, v. 5, no. 7, July 1960, p. 24-26.

12176 Epoxies Fix Old—Build New. Versatile plant-applied coatings are true double-action agents—equally efficient for glass-smoothing old, worn and damaged tank linings or setting up new ones. *Food Engineering*, v. 32, July 1960, p. 80.

12177* Infra-Red *Hot.* Describes a ceramic that efficiently creates infrared heat from gas. ***A. Thomas Haldeman.*** *Gas*, v. 36, Aug. 1960, p. 68-71.

12178* Finishing Lines Surveyed. Discusses equipment available for degreasing, painting and stoving, and advantages of the various systems described. ***J. J. Stordy and W. G. J. Appleton.*** *Industrial Finishing (London)*, v. 12, July 1960, p. 34 + 4 pages.

12179* Solid Lubricating Coatings. Quality of the films, based on highly dispersed molybdenite suspensions and on binding substances, is determined by nature of the binders, method of application, conditions of solidification, and thickness of the coatings. (*In Russian.*) Tverdye smazochnye pokrytiia. ***L. N. Sentiurikhina, E. M. Oparina, Z. S. Rubtsova, and N. A. Suvorovskaia.*** *Khimiia i Tekhnologiia, Toplivo i Masel*, v. 5, no. 7, July 1960, p. 24-29.

12180 Chromate Conversion Coatings. Used for corrosion protection and good appearance as a paint base. Describes application. ***C. W. Ostrander.*** *Materials in Design Engineering*, v. 52, Aug. 1960, p. 116-120.

12181 Strip Coating Techniques. Typical installation for the application of organic finishes to coil Al or steel. *Metal Products Manufacturing*, v. 17, Aug. 1960, p. 30 + 3 pages.

12182* The Deposition of Titanium Carbide on Steel Surfaces. Describes the deposition of pure TiC by the reaction of gaseous $TiCl_4$ with volatile hydrocarbons on steel and cast iron. Discusses some principles of these reactions and the deposition results. Cites the composition of a series of steels suitable for the plating with TiC. (*In German.*) Die Abscheidung von Titankarbidüberzügen auf Stahloberflächen. ***W. Ruppert.*** *Metalloberfläche*, v. 14, July 1960, p. 193-198.

12183 Improved Method for Measuring Abrasion Resistance of Coatings. *National Bureau of Standards, Technical News Bulletin*, v. 44, July 1960, p. 113-114.

12184* Electron Microscopy and Paint Technology: A Survey. A fifteen year survey. Describes techniques of specimen preparation and their historical development; their use in gaining knowledge of the structure of pigment particles, emulsions, paint films, and substrates, and in studying specific technical problems. Modern developments and future potentialities are surveyed. ***S. H. Bell.*** *Oil & Colour Chemists' Association, Journal*, v. 43, July 1960, p. 466-492.

12185* Use of 2-Nitropropane Solvent in Protective Coatings. ***R. F. Purcell.*** *Paint and Varnish Production*, v. 50, no. 9, Aug. 1960, p. 33 + 4 pages.

12186* **Water-Type Industrial Paints.** ***R. B. Drubel and E. J. Walsn.*** *Paint and Varnish Production*, v. 50, no. 9, Aug. 1960, p. 41-42.

12187* **A New Approach to Trimethylolpropane Alkyd Resins.** Comparison is made between trimethylolpropane, glycerine and trimethylolethane-TOFA alkyds and their corresponding enamels. ***T. M. Powanda, J. F. Dash, G. Wiech, and J. A. Vona.*** *Paint and Varnish Production*, v. 50, no. 9, Aug. 1960, p. 45-47.

12188* **Organic Finishes Modified With Silicone Resins.** Finishes to withstand high temperatures can be formulated from conventional paint vehicles blended with silicone resins. *Paint and Varnish Production*, v. 50, no. 9, Aug. 1960, p. 49 + 1 page.

12189* **Monomers for Aqueous Systems.** Reviews the more common vinyl monomers used in emulsion paint vehicles. ***H. A. Cantor and E. J. Ball.*** *Paint Industry Magazine*, v. 75, Aug. 1960, p. 7-8.

12190* **Acrylic Emulsions.** Characteristics of acrylic emulsions as related to those of the styrene-butadiene and polyvinyl acetate types. ***John C. Becker, Jr.*** *Paint Industry Magazine*, v. 75, Aug. 1960, p. 13 + 2 pages.

12191 **Polyester Resins in Wood Finishes. III.** Polyester lacquers are being used in increasing quantities as finishes for furniture and radio cabinets. Concludes discussion of the formulation of these lacquers and gives an account of the development of test procedures. ***L. H. Allan.*** *Paint Manufacture*, v. 30, July 1960, p. 243 + 4 pages.

12192 **PVA, Copolymer and Acrylic Emulsion Paints. A Comparative Study.** Each of the types of resin emulsion now being offered to the British manufacturer of emulsion paints has its advantages and disadvantages. These were assessed in an experimental comparison of such properties as exterior durability, pigment binding power, and resistance to humidity of the derived paints. ***K. A. Safe.*** *Paint Manufacture*, v. 30, July 1960, p. 249 + 6 pages.

12193 **Anticorrosive and Marine Paints.** Experiments with pretreatment and use of different kinds of paint are described. ***J. C. Kingcome.*** *Paint Manufacture*, v. 30, July 1960, p. 255-258.

12194 **Glycerine in Polyurethanes.** While initial work in the urethane oil field seems unpromising, it is apparent that progressive development of these materials will result in some very useful and often outstanding properties being properly exploited. ***C. R. Malyan.*** *Paint Technology*, v. 24, July 1960, p. 17-19.

12195 **Painting Inks for Plastic Films.** ***E. Apps.*** *Paint Technology*, v. 24, July 1960, p. 29-30.

12196 **Viscosity Testing of Thixotropic Paint.** Reviews instruments available for viscosity testing and their suitability for use with paints. ***P. Maddock.*** *Paint Technology*, v. 24, July 1960, p. 32-33.

12197 **Shellac in the Paint Industry.** ***R. Bhattacharya.*** *Paint Technology*, v. 24, July 1960, p. 34-36.

12198* **Tack Rags and Their Performance.** Discusses improvements which were made in relation to samples already taken from the market and analyzed in detail. ***H. W. Chatfield.*** *Product Finishing*, v. 13, July 1960, p. 75-82.

12199 **What Vacuum Metallizers Should Know About Electrostatic Spraying.** Principles of electrostatic painting; how the equipment operates; tips on how to get best results; advantages and disadvantages. ***John Scharnberg and T. E. Hayden.*** *Products Finishing*, v. 24, no. 11, Aug. 1960, p. 58 + 8 pages.

12200* **Physical Properties of Coated Fabrics.** Factors influencing the tear strength and resin/cloth adhesion of coated nylon fabrics are discussed. ***V. K. Hewinson.*** *Rubber Journal and International Plastics*, v. 139, no. 3, July 16, 1960, p. 82 + 2 pages.

12201* **Some Properties and Uses of Clad Metals.** A table classifies the clad metal, its design functions, and applications. ***A. C. Gilbraith.*** *Sheet Metal Industries*, v. 37, July 1960, p. 514-518.

12202* **Calcite Coating Protects Water Pipes.** ***R. F. McCauley.*** *Water & Sewage Works*, v. 107, July 1960, p. 276-281.

12203* **Corrosion Resistance of Zinc Coatings.** Zinc-coated steel was tested in different media. The effects of temperature of the medium, its acidity, and the chemical composition of the coatings were determined. The cause of the so-called "white rust" often found during storage and transport of Zn-coated sheets in closed places was explained and the action of Zn coatings on steel was compared with that of Ni or Sn coatings. (*In Polish.*) Odporność powłok cynkowych na korozje. ***Kazimierz Kurski.*** *Wiadomosci Hutnicze*, v. 16, June 1960, p. 191-196.

See also: **12133** (ozone reaction with hydroperoxides).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

12204* **Transient Processes in Automatic Control Systems.** There are found delay system transfer functions which take into account main circuit delay, delay in main loop of the feedback and in additional loops of the feedbacks. An integral equation for the transient process analyzed is formed and its solution is given as a series converging absolutely and uniformly in any given finite time interval. (*In Russian.*) Perekhodnye protsessy v sistemakh regulirovaniia s zapazdyvaniem. ***Z. Sh. Blokh.*** *Avtomatika i Telemekhanika*, v. 21, no. 6, June 1960, p. 710-719.

12205* **Determination of Transfer Functions of Variable Current Automatic Control Systems.** Proposes a general method to determine transfer functions of variable current automatic control systems described by linear differential equation with periodic coefficients. Limitations applied to the system are ascertained. Transfer functions of some devices are obtained and the method of their simplification is described. (*In Russian.*) Metod polucheniia peredatochnykh funktsiĭ sistem avtomaticheskogo regulirovaniia, rabotaiushchikh na peremennom toke. ***N. P. Vlasov.*** *Avtomatika i Telemekhanika*, v. 21, no. 6, June 1960, p. 772-778.

12206* **Paper-Making Machine as Object for Control and Some Ways of Its Complex Automatization.** The problem of complex automatization of the machine is one of autonomous control. Possible ways of realization of autonomy are explained and the results of the experimental study of the system for controlling the weight of 1 sq m of paper are described. (*In Russian.*) Bumagodelatel'naia mashina kak ob"ekt regulirovaniia i nekotorye puti ee kompleksnoĭ avtomatizatsii. ***A. S. Shamson.*** *Avtomatika i Telemekhanika*, v. 21, no. 6, June 1960, p. 857-866.

12207 **Simulating Speech Through Space.** In communications research, the future becomes the present whenever questions are answered about a system before the system is built. A dependable "answerman" for such questions is Bell Laboratories Sibyl simulator. This device is now being used to collect information on how users will react to a satellite-relay communications system even before the satellite goes up. *Bell Laboratories Record*, v. 38, Aug. 1960, p. 296-298.

12208* **Mechanizing a Large Index.** Discusses problems arising from mechanization of a very large index of names, with particular emphasis on the difficulties arising from incorrect details in inquiries. ***M. A. Wright.*** *Computer Journal*, v. 3, no. 2, July 1960, p. 76-83.

12209* **A Comprehensive Program for Network Problems.** Describes a program which was written for the Pegasus digital computer, which will solve several of the more common problems associated with networks having weighted branches. All operations are carried out within the incidence matrix stored serially by rows in the computer. After a brief introduction to the concepts and terminology of graph theory, a comparison is

made between the two principal ways in which a network may be represented within a computer. ***E. W. Solomon.*** *Computer Journal*, v. 3, no. 2, July 1960, p. 89-97.

12210* The DEUCE Alphacode Translator. Describes a recently completed program for translating from a single-level pseudocode (Alphacode) to a multi-level machine code (orthodox DEUCE code). The chief point of interest is the allocation of the single-level addresses among the three levels of the real computer to obtain an efficient final program. ***F. G. Duncan and D. H. R. Huxtable.*** *Computer Journal*, v. 3, no. 2, July 1960, p. 98-107.

12211* RASTAD System, Data Phone. A new data storage and display system, called RASTAD, illustrates graphically the system's ability to store, retrieve, and display information almost instantaneously. A complete operation from the pressing of the start key to a completed visual display is actually accomplished in less than two seconds. *Data Processing*, v. 2, July 1960, p. 36-37.

12212* A High Speed Digital Data Logging System. Describes a high speed digital data logging system which has been designed to monitor the outputs from a large number of electric transducers, typically thermocouples, strain gages, resistance bulb thermometers, and pressure transducers. ***H. Fuchs and J. R. Wastell.*** *Electronic Engineering*, v. 32, Aug. 1960, p. 468-472.

12213 Plasma Studies May Aid Space Communications. A re-entering space vehicle generates an ion sheath about as thick as its diameter that attenuates radio transmission through it. A communications blackout can result over a wide range of frequencies for several seconds, depending on vehicle course and velocity. ***H. Hodara.*** *Electronics*, v. 33, no. 32, Aug. 5, 1960, p. 70 + 2 pages.

12214 Analog Multiplication Using Time as One Variable. Electronic multiplication can be implemented simply and accurately if one or more of the variables inherently appears as a time interval. Desired products can be proportional to either average or peak output voltage depending on circuit used. ***T. R. Hoffman.*** *Electronics*, v. 33, no. 33, Aug. 12, 1960, p. 136-138.

12215 Engineering Data Processing System Design. The engineering department, designing the modern system, securing management approval, installing the system, operating, controlling, expanding the system, future possibilities are discussed. ***Arthur D. Even.*** 282 pp. 1960. D. Van Nostrand Co., Princeton, N. J. (TA173 Ev23e)

12216* Physical Versus Logical Coupling in Memory Systems. Considers a memory system consisting of bistable static dissipationless units such as ferrites, ferroelectrics, or cryotrons. For a given amount of physical material the memory capacity may be increased by using small volumes of the bistable material for each bit. If made sufficiently small, however, the individual bits will become unreliable because of the influence of thermal agitation and quantum-mechanical tunneling processes. Some unreliability can be tolerated, since it can be compensated by redundancy. Evaluates the optimum size of the individual bit, for maximum information storage. ***J. A. Swanson.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 305-310.

12217* Synthesis of Switching Functions by Linear Graph Theory. Techniques of linear graph theory are applied to the study of switching networks. Treats the relationships among paths and circuits in a graph which gives a simple method of analyzing switching networks. Necessary conditions are given for realizability of switching networks consisting of the specified elements. Gives the synthesis which is accomplished by the use of the decomposition of cut-set matrices. ***W. Mayeda.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 321-328.

12218* Error Correcting Codes for Correcting Bursts of Errors. It is observed that the codes of Abramson, Melas and others are essentially described by the characteristic equation that a certain matrix satisfies. Consequently it is found that transformations of these codes are possible provided that the characteristic equation is preserved. These transformations may then be exploited to produce codes that have a simple implementation. ***J. E. Meggitt.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 329-334.

12219* A Character-Recognition Study. Reports a study of the single-gap-scan approach to character recognition, using an IBM 650 for simulation. Ten specially designed digits were used in this study. Character recognition is discussed in terms of some simple concepts from n-dimensional geometry. The main contribution is an effective method for using a computer to aid in the design of the type font. ***W. E. Dickinson.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 335-348.

12220 Soviet Literature on Control Systems. Most of the better known articles from Soviet literature on the subject of control systems published between Jan. 1953 and Mar. 1959 are cited. Includes: (1) all topics, and (2) only articles which have English translations. ***P. L. Simmons and H. A. Pappo.*** *IRE Transactions on Automatic Control*, v. AC-5, no. 2, June 1960, p. 142-147. (TK1 In6.6ac Vis.)

12221 The Systems Approach: Can Engineers Use the Scientific Method? Defines a system and describes current practice in systems engineering. Suggests methods of science as a guide for the systems approach. Describes some of the tools and concepts used in systems work. ***Albert E. Hickey, Jr.*** *IRE Transactions on Engineering Management*, v. EM-7, no. 2, June 1960, p. 72-80. (TK1 In6.6em Vis.)

12222 A Device for Automatically Tracking the Roll Position of a Missile. Describes an optical method of roll reference which utilizes the relative positions of two flares of different color attached to the rear of the missile. Since the roll position is known at the launch point, commands to the missile are commutated at the launch point rather than in the missile as is necessary when a gyro or other missile-borne roll reference device is used. The roll tracker removes from the missile two subsystems (gyro and commutator) while adding two components (two colored flares). ***Richard W. Lowrie.*** *IRE Transactions on Space Electronics and Telemetry*, v. SET-6, no. 2, June 1960, p. 67-69. (TK1 In6.6r Vis.)

12223* Differentiating an Integrating Circuits With Positive Operational Feedback. Gives a description of differentiating and integrating circuits with positive feedback. A general method of analysis and design is presented and illustrated by a particular circuit. ***A. I. Petrenko.*** *Journal of Electronics and Control*, v. 8, no. 1, Jan. 1960, p. 59-66.

12224* On a Class of Semi-Separable Processes. A class of semi-separable processes is defined and many of its properties, which are the same as the properties of separable processes over the restricted range $t_1 \leq t_2$ or $t_2 \leq t_1$, are summarized. A new property concerning the preservation of separability and semi-separability under linear transformation is proved. Gives an example of a semi-separable process and mentions the importance of this class in nonlinear filtering and prediction. ***J. K. Lubbock.*** *Journal of Electronics and Control*, v. 8, no. 1, Jan. 1960, p. 67-79.

12225* Limitations Due to Noise, Stability and Component Tolerance on the Solution of Partial Differential Equations by Differential Analysers. Considers the solution of partial differential equations by a differential analyzer with regard to the effects of noise, computational instability and the deviation of components from their ideal values. ***Michael E. Fisher.*** *Journal of Electronics and Control*, v. 8, no. 2, Feb. 1960, p. 113-126.

12226* A Closed Loop Data Fitting Problem. Study of data collected from a linear, passive, time-invariant, closed loop reveals that the linear dependence of the control variable upon the input variable makes data collected from such a system unsuitable for the determination of its dynamics. Shows that the introduction of a disturbance into the loop can destroy the linear dependence, but special care may still be necessary for the determination of the dynamics from the data. ***R. A. Woodrow.*** *Journal of Electronics and Control*, v. 8, no. 2, Feb. 1960, p. 149-160.

12227* The Phase-Plane Method for the Analysis of Non-Linear Control Systems. II. The servomechanism with saturating error amplifier, optimum switching, real and virtual

singular points, cylindrical phase-space are discussed. ***P. Naslin.*** *Process Control and Automation*, v. 7, July 1960, p. 333-338.

12228* Trends in the Development of Data Processing Systems and Relative Techniques. The main features of newly developed data processing systems are reviewed, with particular regard to small and medium-size machines and to some special applications. New techniques and technologies are reviewed especially as regards thin magnetic components, microwave circuits and microminiaturization. (*In Italian.*) Direzioni di sviluppo dei sistemi di elaborazione dell'informazione e delle tecniche relative. ***Paolo Ercoli.*** *Ricerca Scientifica*, v. 30, Mar. 1960, p. 288-312.

12229* New Memory Systems Based on Tridimensional Magnetic Components. After comparing advantages offered by present-day techniques in the field of magnetic-core memories, three very recent advances are examined. The first two are new circuit techniques: impulse or partial switching, and linear selection diode steered memory with automatic rewrite selection. The third is based on the use of a new multiaperture element: the biax. (*In Italian.*) Nuovi sistemi di memoria basati sulla magnetizzazione di elementi tridimensionali. ***Roberto Vacca.*** *Ricerca Scientifica*, v. 30, Apr. 1960, p. 445-459.

ELECTRICAL ENGINEERING

12230 Microwave by Pole Line. Microwave on pole lines replaces open wires, coaxial cables, waveguides, and r-f links. It is a practical tool; its parameters are well defined and can be used as well as those of another cable. Completed systems are in full agreement with experiments and theory. Public utilities can exploit their extensive pole plant without FCC channel allocation. There is no limit to distance, and r-f equipment — terminal as well as intermediate — is available for connection. The New York Central G-Line proved the economy and operational characteristics of this system. Since long-distance communication systems can only be demonstrated if the system is actually installed and operated, our public utilities as pole owners and our wire manufacturers must cooperate with the system engineers if the G-Line is to be used to its full broadband and low-low capabilities. ***Theodore Hafner.*** *Electrical Engineering*, v. 79, Aug. 1960, p. 638-642.

12231 Temperature Telemetry Aids Frozen Food Study. Temperature-sensitive transmitters distributed throughout 50-ton batches of frozen fruit give temperature-distribution information. ***R. H. Elsken.*** *Electronics*, v. 33, no. 33, Aug. 12, 1960, p. 129-131.

12232* Investigation of an Electrothermic Evaporating Apparatus. The energetic analysis of the electrothermic cooling effect revealed that the usual method in producing cold with compression and absorption machines is more effective. Tests on low production evaporators confirmed the possibility to reduce the electric-power consumption four to five times as compared with direct electrical heating, in the case of temperatures in the apparatus equal to 10 C. (*In Russian.*) Issledovanie elektrotermicheskoĭ isparitel'noĭ ustanovki. ***V. S. Martynovskii and V. A. Naer.*** *Izvestiia Vysshikh Uchebnykh Zavedeniĭ, Energetika*, 1960, no. 6, June, p. 104-109.

12233* Cross Sections for Ionization of the Inert Gases by Electron Impact. Measurements of the total cross sections for ionization of the rare gases Ar, Kr, and Xe under electron impact over the electron energy range up to 100 ev have been made with a Lozier apparatus. Measurements in Ar show close agreement with those of Tate and Smith except in the low energy region, i.e., below about 25 ev. ***B. A. Tozer and J. D. Craggs.*** *Journal of Electronics and Control*, v. 8, no. 2, Feb. 1960, p. 103-109.

12234 Electromagnetic Fault Detection on Non-Ferrous Pipes. Theoretical predictions become possible when the current distribution in the pipe is known. A simplified model, consisting of a circular thin shell (pipe) surrounded by a coaxial current circle (short coil), permits calculation of the current distribution to a sufficient degree of accuracy. Describes an experiment proving that, up to a certain test frequency, an actual pipe behaves like a shell with uniform current penetration. ***P. Graneau and S. A. Swann.*** *Journal of Electronics and Control*, v. 8, no. 2, Feb. 1960, p. 127-147.

12235* Construction of a Magnetic Field Meter for the Harmonics Method. Describes instrument which serves for measuring small magnetic field strengths (approx. 10^{-5} to 10^{-1} Oe). For these measurements, the nonlinearity of the magnetization curve of a ferromagnetic material is utilized. The field being tested generates, in a transformer, the odd multiples of the basic frequency, and is automatically compensated by a counter field; the odd multiples of the basic frequency disappear. (*In German.*) Aufbau eines Magnetfeldmessgerätes nach dem Oberwellenverfahren. ***K. Brankoff.*** *Nachrichtentechnik*, v. 10, no. 6, June 1960, p. 247-256.

12236 The Erosion of Relay Contacts. The wear of relay contacts is chiefly electrical and due to discharges occurring when the contacts are opened and closed. Arcs cause more damage than do glow discharges and account for most of the damage. Short arcs at relay contacts are of two types which predominantly erode respectively the anode and the cathode. The type of arc which occurs and its duration are enormously influenced by foreign material on the contact surface. The chief source of foreign material in many applications is organic vapor from the atmosphere, which can be decomposed to form surface C. ***L. H. Germer.*** *Wear*, v. 3, no. 3, May-June 1960, p. 188-199.

ELECTROCHEMISTRY

12237* The Effect of the pH of the Electrolyte-Solution on the Amount and Composition of Isolated Oxide-Inclusions in Killed Thomas Steel. Describes electrolytical isolation at low pH values, an electrolysis cell for a continuous registration of the measurement of the pH, change of the pH during electrolysis, analyses of residues after the isolation in variously strong acidified electrolytes. (*In German.*) Der Einfluss des pH-Wertes der Elektrolytlösung auf Menge und Zusammensetzung der isolierten Oxydeinschlüsse vollberuhigter Thomasstähle. ***Erich Piper, Heinz Hagedorn, and Manfred Fröhlich.*** *Archiv für das Eisenhüttenwesen*, v. 31, no. 6, June 1960, p. 355-358.

12238 Electropolishing, Anodizing and Electrolytic Pickling of Metals. Discusses electrolytic pickling of metals, electropolishing of metals, electropolishing steel, electropolishing nonferrous, light, and precious metals, effect of electropolishing on metal properties, practical electropolishing, applications of anodized aluminum, and anodizing other metals. ***N. P. Fedot'ev and S. Ya. Grilikhes.*** 285 pp. 1959. Robert Draper Ltd., Teddington, Great Britain. (TS213 F31etr)

12239* On the Electrolytic Nickel Refining in Sulphate and Chloride Solution. Concludes that the use of pure chloride solutions with a high concentration of the Ni ion or of chloride-sulfate solutions with a high concentration of Ni and Cl at a relatively low content of the sulfate ion intensifies the operating plants of electrolysis without any considerable expenditures, increasing its productivity by 1.5-2.0 times. Using high concentration of Ni, increasing the density of the current, and reducing the velocity of circulation of the solution, one can increase the productivity of the tank of electrolysis without any increase of the capacity of the apparatus for the cleaning of Fe and Co. (*In Russian.*) Ob elektroliticheskom rafinirovanii nikelia v sul'fatno-khloristykh i khloristykh rastvorakh. ***A. I. Zhurin.*** *Izvestiia Vysshikh Uchebnykh Zavedeniĭ, TSvetnaia Metallurgiia*, 1960, no. 3, p. 54-61.

12240* Investigation of Cathode Processes at Zinc Electrodeposition by Using Radioactive Indicators. It was found that the reverse dissolving of Zn is most intensive in the absence of current, that it decreases with the increase of the cathode polarization and that at −0.894 V ($D_k \geq 840$ a/sq.m) the corrosion process ceases. At high densities of the current, the self-dissolving of Zn ceases; in this case the liberation of H is caused by the primary electrode reaction. It was found that Sb and Bi, introduced into the electrolyte, cause a depolarizing effect on the discharge of Zn ions and contribute to the

crystallization of Zn. It was confirmed that the casing of the peeling of Zn in the presence of Sb is in connection with the formation of a separating layer. It was shown that a similar effect on the peeling can be observed on addition of bismuth salts. (*In Russian.*) Issledovanie katodnkh protsessov pri elektroosazhdenii tsinka s primeneniem radioaktivnykh indikatorov. ***A. I. Levin and V. I. Falicheva.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no. 3, p. 62-69.

12241 New Routes to Better Electroplate for Zinc Die Castings. Electroplaters have come up with three promising plating practices—duplex Ni, crack-free Cr, and duplex Cr. Duplex Ni is now in wide use and increased application of crack-free Cr for improved performance is predicted. Suggests that duplex Cr (greater than 0.1 mil) might be more economical for those plants not adopting duplex Ni. ***W. H. Safranek.*** *Metal Progress,* v. 78, no. 1, July 1960, p. 69-75.

12242* Studies Concerning the Mechanism of Hydrogen Penetration Into Metals During Electrolysis. Thin layers of Ni may be charged with H to a very high concentration. A H-rich crystal phase is formed, having about 6% greater lattice spacing when compared with pure Ni. The behavior of Ni toward H is like that of Pd on one hand, and that of Fe on the other. (*In Polish.*) Z badań nad mechanizmem wnikania wodoru do metali w czasie elektrolizy. ***Michał Smiałowski.*** *Wiadomosci Chemiczne,* v. 14, May 1960, p. 273-278.

12243* A Method of Investigation of the Transfer of Hydrogen on Palladium Electrodes by Measuring the Resistance. A previously developed method was used for the investigation of the influence of surface coverings on the velocity of transfer of H into Pd with certain acceptors of H. Consists of measuring the longitudinal resistance of a loop of Pd wire; the resistance depends on the content of H in the wire. If the occlusion of H is carried out by a cathode-charging current, then under certain circumstances, changes of the resistance may take place during the connecting and disconnecting. The investigation showed that these effects on the active wire were in connection with a changing, additional electrical conductivity of the electrolyte. (*In German.*) Über die Methode zur Verfolgung der Umsetzungen des Wasserstoffs an Palladiumelektroden mit Hilfe von Widerstandsmessungen. ***C. A. Knorr and D. Roemer.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 64, no. 4, May 1960, p. 456-462.

12244* Determination of the Diffusion Coefficients D_{H_2}, D_{H^+} and D_{OH^-} With the Platinum-Plate Electrode. An experimental apparatus with a plate-electrode is described. The diffusion coefficient D_{H_2} in 0.5*N* H_2SO_4, 5*N* H_2SO_4, and in 0.1*M* Na_2SO_4 is determined for the temperature range of −10 to 60 C by the Lewitsh formula from the measurements of the density of the anodic limiting current of the H molecule. The diffusion coefficient D_{H^+} is determined in weak acid 0.1*M* Na_2SO_4 at 20 C from the density of the cathodic limiting current of H+ ions; the diffusion coefficient D_{OH} is determined in a weakly alkaline 0.1*M* Na_2SO_4 solution from the density of the anodic OH− ion limiting current. (*In German.*) Bestimmung der Diffusionskoeffizienten D_{H_2}, D_{H^+} und D_{OH^-} mit der Platinscheibenelektrode. ***M. Breiter and K. Hoffmann.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 64, no. 4, May 1960, p. 462-467.

12245* Electrode Reactions on Active, Passive and Transpassive Chromium. The electrochemical behavior of Cr was investigated in H_2SO_4 and KOH solutions in the p_H range of 0-14. The basis for this is a symposium of appropriate thermodynamic data about the substance system Cr/aqueous electrolyte. Gives an $U_H(a_i)$ diagram for the most essential electrode reactions. The applied methods of measurement are described. (*In German.*) Über Elektrodenreaktionen am aktiven, passiven und transpassiven Chrom. ***H. Weidinger and E. Lange.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 64, no. 4, May 1960, p. 468-477.

12246* A Comparison of Voltage Series in Various Solvents. II. A new method is added to the existing methods for a suitable connection of the voltage series in non-aqueous solvents with those of water ($E_H^0(H_2O) = 0$. The redox normal potential of satisfactorily selected redox systems can be approximately considered as independent on the kind of the solvent. There is a possibility to join together the voltage series. (*In German.*) Der Vergleich der Spannungsreihen in verschiedenen Solventien. II. ***H.-M. Koepp, H. Wendt, and H. Strehlow.*** *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 64, no. 4, May 1960, p. 483-491.

ELECTRONICS

12247 Radio-Frequency Mass Spectrometer for the Investigation of the Ionic Composition of the Upper Atmosphere. Describes construction of a mass spectrometer developed in the Soviet Union for investigation of the ionosphere, and also mass-spectrometer operating procedure. ***V. G. Istomin.*** *ARS Journal,* v. 30, July 1960, p. 676-684.

12248* Partial Reflections in the Atmosphere and Remote Propagation. VII. Note About the Troposphere Propagation Phenomena. The reflection phenomenon is studied in connection with the reflecting elements of the irregular surface of a tropospheric sheet. The difference between the treatment of the problem involved by specular and by diffuse reflection is emphasized. By applying these results and turbulent diffusion process to the phenomenon of tropospheric propagation, the different elements of this complex phenomenon are displayed and compared together. (*In French.*) Réflexions partielles dans l'atmosphère et propagation a grande distance. ***François du Castel, Pierre Misme, André Spizzichino, and Jean Voge.*** *Annales des Telecommunications,* v. 15, nos. 5-6, May-June 1960, p. 137-142.

12249 The Design of Radar Signals Both High Range Resolution and High Velocity Resolution. Discusses some fundamental limitations on simultaneous range-velocity determination in terms of ambiguity diagrams, with the aid of a quantum mechanical analog to the Wigner distribution function. A sequence of signals is found in which the signals yield both range and velocity information with increasing accuracy. ***J. R. Klauder.*** *Bell System Technical Journal,* v. 39, no. 4, July 1960, p. 809-820.

12250 The TJ Radio Relay System. The TJ radio relay system is a broadband microwave facility that operates in the 10,700- to 11,700-mc common carrier frequency band; specifically designed for short-haul transmission of either multichannel telephone or television circuits. Transmission performance and the over-all system description are presented, as well as some early field applications. ***J. Gammie and S. D. Hathaway.*** *Bell System Technical Journal,* v. 39, no. 4, July 1960, p. 821-877.

12251 Evaluation of Message Circuit Noise. Pertinent to message circuit noise measurement is the characterization of the relative interfering effect of single-frequency noise components and the way the ear combines these components to indicate the total effect. The correlation between a noise measurement and its associated over-all end effect may be made by finding the transmission-loss equivalent of the noise being measured or by the direct application of telephone-user opinions expressing degree of transmission satisfaction. ***A. J. Aikens and D. A. Lewinski.*** *Bell System Technical Journal,* v. 39, no. 4, July 1960, p. 879-909.

12252 A New Measuring Set for Message Circuit Noise. Describes a new message circuit-noise measuring set; easily portable, visual-indicating and direct-reading device with which rapid and accurate noise measurements may be made. Fully transistorized and battery powered, small in size and light in weight; can be used for bridging, terminating and noise-to-ground measurements with a variety of plug-in weighting networks. ***W. T. Cochran and D. A. Lewinski.*** *Bell System Technical Journal,* v. 39, no. 4, July 1960, p. 911-931.

12253 The Construction of Missile Guidance Codes Resistant to Random Interference. Discusses the problem of encoding command information (i.e., selecting the time spacings between pulses) so that m false pulses ($m \leq n - 2$) cannot

combine with the n true pulses in any way to form a false command. Certain lower bounds, together with a few empirically derived codes approaching these lower bounds are presented. ***A. R. Eckler.*** *Bell System Technical Journal*, v. 39, no. 4, July 1960, p. 973-994.

12254 Passage Effects in Paramagnetic Resonance Experiments. Attempts to classify theoretically paramagnetic resonance signals of inhomogeneously broadened lines occurring under various experimental conditions. The theoretical predictions are checked experimentally. Special emphasis is given to cases in which T_1 is long, and to cases in which the adiabatic condition $\gamma H_1^2 \gg dH/dt$ is violated. ***M. Weger.*** *Bell System Technical Journal*, v. 39, no. 4, July 1960, p. 1013-1112.

12255 A New Naval Facility for Measuring Low-Level Magnetic Fields. Recent advances in naval undersea warfare have brought increased emphasis to the measurement and reduction of even the very low-level d-c magnetic fields which Naval ships may produce. Describes one part of the U. S. Navy's current effort in this area, a new Magnetic Field Facility at the Navy's Engineering Experiment Station in Annapolis, Md. ***W. W. Anderson.*** *Electrical Engineering*, v. 79, Aug. 1960, p. 655-660.

12256* Microwaves—Principles and Devices. The behavior of most guided-wave systems can be reduced to an equivalent network employing lumped and distributed parameters. Once a mechanical structure can be reduced to an equivalent network, all of the analytical techniques of circuit theory can be applied. Conversely, the performance of some devices, such as filters, can be predicted accurately from their network representation and then reduced in practice to an appropriate transmission-line structure. ***Milton Tenzer and John P. Agrios.*** *Electrical Manufacturing*, v. 66, Aug. 1960, p. 90-112.

12257 Calculating Bandwidths for Matching Networks. Matching networks are used between source and load to obtain maximum energy transfer and to eliminate reflection losses. They also provide selectivity. A technique is described to calculate the bandwidth. ***H. B. Yin.*** *Electronic Industries*, v. 19, July 1960, p. 70-74.

12258 "Compactrons". Describes new series of multifunction tubes for consumer applications introduced by General Electric and reports possibilities for substantial size reductions and manufacturing economies. *Electronic Industries*, v. 19, July 1960, p. 81 + 2 pages.

12259 Switching With Transistors. II. Most of the steady-state characteristics were treated. Completes discussion and treats transient characteristics; concludes with parameters and circuit performances. ***Gerald Luecke.*** *Electronic Industries*, v. 19, July 1960, p. 82-87.

12260 Analysis of RFI in Transmission Lines and Filters. In designing and installing transmission lines it is necessary to consider the role played by RFI. Gives basic considerations, including physical characteristics which are associated with the analysis or control of interference situations. The mathematical techniques used are demonstrated step-by-step. ***Delmer C. Ports, A. R. Howland, Jr., and Robert M. Moore.*** *Electronic Industries*, v. 19, July 1960, p. 93-100.

12261 Electronic Switching, Timing, and Pulse Circuits. Discusses switching and timing systems, some circuit fundamentals, electron devices as switching element, some circuit examples incorporating electron devices, stable states and regenerative switching, multivibrators, circuits containing inductors or transformers, lines and pulse-forming networks. ***Joseph M. Pettit.*** 267 pp. 1959. McGraw-Hill, New York. (TK7870 P45e)

12262* Phase-Measuring Equipment. Equipment was developed to investigate the phase difference between the signals from a single very low-frequency transmitter received at two sites simultaneously. A reference frequency at each site was derived from the pulse-recurrence frequency of the transmissions from stations of the Gee navigational system and, by using it to change the frequency of the received v.l.f. signal, an audio-frequency signal was obtained which had the phase characteristics of the v.l.f. signal. ***G. E. Ashwell and C. S. Fowler.*** *Electronic Technology*, v. 37, July 1960, p. 252-255.

12263 Modern Microwaves. Covers applications, antennas, generators and amplifiers, components and test equipment. ***Sylvester P. Carter and Leslie Solomon, editors.*** *Electronics*, v. 33, no. 26, June 24, 1960, p. 67-86.

12264 Transistor Heat Sink Calculations. Calculations are simplified if radiation cooling alone is considered; the problem is then solved by using a flat plate as the heat sink for all transistors. ***Myron Greenbaum.*** *Electronics*, v. 33, no. 32, Aug. 5, 1960, p. 66 + 1 page.

12265 Circuit Applications of Field Effect Transistors. Photosensitive cadmium-sulfide transistors can be used in relaxation oscillators, amplifiers, and phase-shift oscillators. Compares characteristics with those of junction transitor, vacuum triode, and vacuum pentode. ***R. R. Bockemuehl.*** *Electronics*, v. 33, no. 33, Aug. 12, 1960, p. 132-135.

12266* A Contribution to the Analysis of the Stability of Tube Circuits and of Circuits Semiconductor Triodes. Describes a method to obtain the characteristic equation of a linear electrical circuit need for the analysis of its stability. It is based on the presentation of a circuit in the form of a quadripole where the poles of the left and of right ends are either short-circuited, or open-circuited, or directly connected. Gives a theoretical basis of the method and examples of application. (*In Russian.*) K analizu ustoĭchivosti lampovykh skhem i skhem na poluprovodnikovykh triodakh. ***E. V. Zeliakh.*** *Elektrosviaz'*, v. 14, no. 7, July 1960, p. 47-59.

12267* Locus Curves of the Complex Permeability of Thin Strips. On strips of nickel-iron and cobalt-iron alloys with thicknesses down to 2.3 mm, measurements of the complex permeability are carried out at very low field strengths and frequencies up to approximately 30 Mc/s. Results reveal that with nearly all materials and sufficiently low strip thickness locus curves come about that considerably extend beyond the classical locus curve of the eddy currents. (*In German.*) Ortskurven der komplexen Permeabilität dünner Bänder. ***R. Boll.*** *Frequenz*, v. 14, July 1960, p. 227-238.

12268* Electrical Properties of Vapor-Grown Ge Junctions. A method of fabricating p-n junctions and p-n junction devices by a closed-cycle iodide vapor-growth process is described. The electrical characteristics of junctions made by alternately depositing p-type and n-type Ge onto a Ge substrate compare favorably with those fabricated by other means. ***M. J. O'Rourke, J. C. Marinace, R. L. Anderson, and W. H. White.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 256-263.

12269* A Vapor-Grown Variable Capacitance Diode. Germanium p-n junctions were made which have a large fractional variation of capacitance with voltage and show promise of being operable at high frequencies. These diodes are produced by a vapor-growth process in which the doping is switched from n-type to p-type during growth. Capacitances which vary as the reciprocal of voltage over a considerable range were observed. ***R. L. Anderson and M. J. O'Rourke.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 264-268.

12270* Synthesis of a Communication Net. Gives a systematic method for the realization of communication nets from their terminal capacity matrices. This procedure results in a net whose total branch capacity is minimum for all nets satisfying the same terminal capacity matrix. Shows that when the terminal capacity matrix is indeterminate, for a given total branch capacity, the total terminal capacity is highest when all terminal capacities are made equal. ***R. T. Chien.*** *IBM Journal of Research and Development*, v. 4, no. 3, July 1960, p. 311-320.

12271 Infinite Integral Transforms in Diffraction Theory. Indicates the theory of the diffraction of a scalar plane wave in turn by a circular cylinder, a sphere, and a parabolic cylinder. ***P. C. Clemmow.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S7-S11. (TK1 In6.6ap Vis.)

12272 Diffraction of Scalar Waves by a Circular Aperture. Presents new integral representations of the solution which have the virtue of automatically satisfying the time-reduced wave equation, the radiation condition, and the boundary conditions.

shows the unknown functions appearing in these representations to satisfy Fredholm-type integral equations of the second kind which yield, after iteration, accurate, approximate solutions when ka (the product of the wave number and the aperture radius) is sufficiently small. The results are in complete agreement with known results and for some of these quantities they are more accurate in that higher powers of ka are included. Finally, in the case of the rigid screen problem, for all values of ka, the form of the edge behavior is determined and a simple proof of the unique existence of the solution is given. ***J. Bazer and A. Brown.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S12-S20. (TK1 In6.6ap Vis.)

12273 Scalar Diffraction by an Elliptic Cylinder. Calculates the surface distribution in the shadow zone and derives the "creeping wave" representation for the scattered field in the shadow zone. Shows that the results are applicable if and only if $R_0 \omega \gg 1$, where R_0 is the smallest radius of curvature on the cylinder and ω is the wave number. ***N. D. Kazarinoff and R. K. Ritt.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S21-S27. (TK1 In6.6ap Vis.)

12274 Reduction of the Integral Equations for High-Frequency Diffraction by Disks and Strips. Applications are made to diffraction by strips and disks with incident waves of arbitrary form. Special results involving diffraction of plane waves are recovered from the general formulas. ***B. Noble.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S37-S42. (TK1 In6.6ap Vis.)

12275 Pulse Return From a Sphere. Investigates the back scattering of short plane-wave harmonic pulses incident on a perfectly conducting sphere for both near and far fields. Expresses the pulse return in terms of the inverse Laplace transform of the CW back-scattered field. Calculates the inverse transform for the initial part of the pulse return using a Tauberian theorem. Gives the latter part of the pulse return in terms of residues representing the natural oscillations of the spheres. This residue expression converges rapidly for small ka or ka of the order of 1. However, for $ka \gg 1$, the particular residue series is slowly convergent, but the terms which are slowly convergent can again be summed, using methods of contour integration to give the CW creeping waves plus transients. Calculations of the pulse return for the case $ka = 1$, indicate that there is significant tail to the pulse return in the "resonance" region. For very large ka, the tail of the pulse return is the order of $1/ka$ of the head. In the high frequency limit, there is no pulse distortion. ***V. H. Weston.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S43-S51. (TK1 In6.6ap Vis.)

12276 Decay Exponents and Diffraction Coefficients for Surface Waves on Surfaces of Nonconstant Curvature. The results consist of leading terms which depend upon the curvature of the surface and corrections which depend upon the derivative of the curvature. The leading terms coincide with those found previously. With these corrections, the geometric theory of diffraction can be used at longer wavelengths than before. ***Joseph B. Keller and Bertram R. Levy.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S52-S61. (TK1 In6.6ap Vis.)

12277 New Results in Backscattering From Cones and Spheroids. Gives experimental results for back-scattering cross sections of cones, prolate spheroids, and oblate spheroids. Gives a brief résumé of the image-plane technique used in measuring cross sections. Calibration data show that for cross sections of the order of spheres of 3-in. dia. the attainable accuracy is better than 0.5 db. Compares cross-section data for various aspects of the targets with geometrical optics cross sections and those obtained by various other theoretical procedures. Some interpretation of the observed phenomena is made in terms of high-frequency approximation techniques. ***A. Olte and S. Silver.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S61-S67. (TK1 In6.6ap Vis.)

12278 Diffraction by Surfaces of Variable Curvature. To investigate the influence of variable curvature on the damping of diffracted waves (creeping waves) the integral equation method has been applied to an arbitrary convex cylinder. In addition to the well-known damping factor, depending on the radius of curvature R, a first-order correction term yields an amplitude factor $R^{-1/6}$, while the second-order correction term results in a change in damping depending on the curvature and its first and second derivatives. ***W. Franz and K. Klante.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S68-S70. (TK1 In6.6ap Vis.)

12279 Diffraction of an Electromagnetic Plane Wave by a Funnel-Shaped Screen. Gives the deviation from plane-screen diffraction and the dependence on the angle ϕ_0 defining the shape of the funnel for both concave-side and convex-side incidence. Obtains simple closed form results. ***Werner Braunbek.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S71-S77. (TK1 In6.6ap Vis.)

12280 The Diffraction and Refraction of Plane Pulses. Describes a method for solving problems of plane pulse diffraction by a perfectly conducting wedge. Method is extended to give results when a conductive half-plane lies on the surface between two distinct isotropic media of different dielectric properties. ***V. M. Papadopoulos.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S78-S87. (TK1 In6.6ap Vis.)

12281 Diffraction by a Half-Plane With a Special Impedance Variation. ***J. Shmoys.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S88-S90. (TK1 In6.6ap Vis.)

12282 A New Method for the Determination of Far Fields With Applications to the Problem of Radiation of a Line Source at the Tip of an Absorbing Wedge. The exterior angle of the wedge is $2\pi - \pi/2n$, where n is the integer. The excitation may be either an incident plane wave or a line source. Describes method for the case of an absorbing wedge with a line source located at the tip. Gives several examples to illustrate the method. Also shows that the method can be applied directly to the classical problem of perfectly conducting wedges. ***S. N. Karp and F. C. Karal, Jr.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S91-S102. (TK1 In6.6ap Vis.)

12283 Some New Forms of Huygens' Principle. ***V. H. Rumsey.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S103-S116. (TK1 In6.6ap Vis.)

12284 General Theorems on the Transmission Coefficient From a Transmitting to a Receiving System. ***Jean Robieux.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S118. (TK1 In6.6ap Vis.)

12285 The Synthesis of Large Radio Telescopes by the Use of Radio Interferometers. Gives outline of a method of simulating the resolving power of large radio telescopes by a process of synthesis, in which use is made of measurements taken with smaller structures arranged in different configurations. The method was applied to the construction of some large radio telescopes at Cambridge. ***M. Ryle, A. Hewish, and J. R. Shakeshaft.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S120-S124. (TK1 In6.6ap Vis.)

12286 Experimental Test of a Stepped Zone Mirror for Microwaves. A model of the mirror was built to operate with $\lambda = 3.2$ cm. The focal length is 86.4 cm and the angular aperture 120°. The test gave results in perfect agreement with the theory within a total field of about 40°. Special astigmatic receivers were designed and built to eliminate the effect of the astigmatism. It is believed that the mirror may be used as a fixed antenna for radio astronomy. ***G. Toraldo di Francia, L. Ronchi, and V. Russo.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S125-S131. (TK1 In6.6ap Vis.)

12287 Anatomy of "Surface Waves". Calls attention to the fact that as a group these wave types have no important physical properties in common. ***S. A. Schelkunoff.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S133-S139. (TK1 In6.6ap Vis.)

12288 Waves on Interfaces. In wave propagation along plane or cylindrical interfaces, a distinction is made between truly guided waves (surface waves) and partially guided waves (radiating waves). When dissipation losses are involved, surface waves no longer represent the asymptotic field near the interfaces at large distances from the source. In order to separate them from the total field, it is necessary to have a criterion for radiating waves which are free of any surface wave components. Such a criterion exists in the form of orthogonality relations which are the mathematical formulation of the concept that an ideal antenna which excites only a surface wave should not receive a radiating wave. ***Georg Goubau.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S140-S146. (TK1 In6.6ap Vis.)

12289 Surface Waves Supported by Cylindrical Surfaces. Discusses a method of calculating the radiation which arises when a wave of this kind circulates around a highly reactive supporting surface of cylindrical form. Concludes that when the surface has a finite loss, there will be a particular radius of curvature for which no power is transferred across the interface. ***H. M. Barlow.*** *IRE Transactions on Antennas and Propagation*, v. AP-7. Special Suppl., Dec. 1959, p. S147-S153. (TK1 In6.6ap Vis.)

12290 Guiding of Electromagnetic Waves by Uniformly Rough Surfaces. I. Indicates that to a first order, a rough surface of the kind described possesses an inductive surface reactance and will support a trapped wave. The effect of finite conductivity of the bosses is to damp exponentially this trapped wave. ***James R. Wait.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S154-S162. (TK1 In6.6ap Vis.)

12291 Guiding of Electromagnetic Waves by Uniformly Rough Surfaces. II. Shows that the curvature has a profound influence on the nature of the surface wave, although it uniformly approaches the conditions for a plane boundary as the radius of curvature approaches infinity. ***James R. Wait.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S163-S168. (TK1 In6.6ap Vis.)

12292 Some Theoretical Results for Surface Wave Launchers. Examines the design of surface wave launchers and shows that the efficiency of a launcher of finite size can approach arbitrarily near to 100%. For a given size of launcher, there is, however, a limit to the efficiency above which an increase is obtained only at the expense of frequency bandwidth. Launchers with efficiencies above this limit are classed as "super-efficient" by analogy with "super-gain" aerials. Gives a general solution for an end-fire launcher. ***J. Brown.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S169-S174. (TK1 In6.6ap Vis.)

12293 The Surface-Wave Concept in Connection With Propagation Trajectories Associated With the Sommerfeld Problem. Both the continuous-wave solution and the pulse solution of the Sommerfeld problem can be represented as multiple integrals which describe cooperating contributions propagated along continuous sets of trajectories. The latter consist of a number of rectilinear sections that connect the transmitter and receiver. The propagation velocity along each section is in accordance with the corresponding medium. The velocity along section lying in the earth's surface is that of the well-known surface wave. Transient phenomena at the receiver start after the arrival of a main pulse along the trajectory connecting the transmitter and the receiver in accordance with ordinary geometric optics, ignoring surface-wave effects. Pulses along trajectories containing a surface-wave section may arrive earlier; however, their joint contributions then cancel each other until the arrival of the main pulse. ***H. Bremmer.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S175-S182. (TK1 In6.6ap Vis.)

12294 The Transmission Characteristics of a Corrugated Guide. The corrugated guide behaves much like the Goubau guide if the corrugation depth is small with respect to the wavelength. Corresponding to the influence of the dielectric on the Goubau guide, increasing depth of the corrugations increases also, on this guide, the attenuation of the waves, decreases the phase velocity, and increases the field concentration around the guide accordingly. As a rule, however, the corrugated guide acts as a low pass whose pass bands are about at $k \cdot 0.5 < d/\lambda_0 < (0.25 + k \cdot 0.5)$ and whose stop bands are about at $(0.25 + k \cdot 0.5) < d/\lambda_0 < 0.5(1 + k)$ ($k = 0, 1, 2, \cdots$, d = corrugation depth, λ_0 = wavelength of a plane wave in space). The propagation of waves around the earth cannot only be considerably curbed by building fronts and mountain ranges, but can even be suppressed altogether. ***Gerhard Piefke.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S183-S190. (TK1 In6.6ap Vis.)

12295 Radiation and Guided Waves. Shows that depending on conditions modal-type propagation can take place between the parallel interfaces in addition to radiation field. Distinction is drawn between proper modes, quasimodes, surface waves, leaky waves and radiation field. All these waves are needed in the complete description of the field, and their relative intensities are evaluated. In general (with the exception of perfectly conducting tubular waveguides), shows that no mode can exist on its own but rather in conjunction with other modes (including surface waves) and the radiation field. ***A. E. Karbowiak.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S191-S200. (TK1 In6.6ap Vis.)

12296 Guided Waves on Sinusoidally-Modulated Reactance Surfaces. Expresses explicit field amplitudes and determinantal equation for the propagation wavenumber in a continued fraction form which is rapidly convergent for all values of modulation. Obtains numerical results for both surface wave (modal) and leaky wave (nonmodal) solutions. Discusses the relevance of these studies to high-gain modulated surface-wave antennas. ***A. A. Oliner and A. Hessel.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S201-S208. (TK1 In6.6ap Vis.)

12297 On the Excitation of the Waves of Proper Solutions. Obtains an exact and explicit solution for an electromagnetic field excited by a vertical electric dipole located over a flat plane of arbitrary surface impedance Z. Though there are four asymptotic expansions, the expansion by Hadamard's method seems to have the most explicit physical meaning. According to this expansion, only the proper solution of the ordinary surface wave can be present explicitly on the established condition of $\arg(Z) > \pi/4$. ***Koichi Furutsu.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S209-S218. (TK1 In6.6ap Vis.)

12298 Surface-Wave Research in Sheffield. Deals with the radiation from a cylindrical surface-wave resonator. Presents some numerical results obtained by an electronic computer of the guide-wavelength/dielectric constant relationship for the EH_{11} mode on a dielectric rod. Deals with the coupling between two adjacent surface waveguides. Discusses parallel dielectric sheets and parallel rods theoretically. Presents the theory of a new form of surface-wave launching antenna, including an evaluation of its launching efficiency. ***M. F. Bracey, A. L. Cullen, E. F. F. Gillespie, and J. A. Staniforth.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S219-S225. (TK1 In6.6ap Vis.)

12299 Electromagnetic Properties of Wedge and Cone Surfaces With a Linearly Varying Surface Impedance. Obtains alternative field representations and describes their utility. Gives special attention to reactive surfaces which can support a new type of surface wave. This surface wave is of interest for an analysis of surface wave antennas with a linear reactance taper. ***L. B. Felsen.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S231-S243. (TK1 In6.6ap Vis.)

12300 The Finite Range Wiener-Hopf Integral Equation and a Boundary Value Problem in a Waveguide. The method developed can be applied to certain other problems of mathematical physics; includes a number of examples of such problems. ***Raj Mittra.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S244-S254. (TK1 In6.6ap Vis.)

12301 On the Discontinuity Problem at the Input to an Anisotropic Waveguide. Numerical results are found to agree reasonably well with those obtained from an alternative solution to this problem given by Sharpe and Heim. ***A. D. Bresler.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S261-S272. (TK1 In6.6ap Vis.)

12302 A Ferrite-Filled Cylindrical Cavity. The measured resonant frequencies are in general agreement with numerical results based on the solution of the characteristic equation and the theories of Polder and Rado. Assuming that $\mu_z \approx \mu$, the components of the tensor permeability below the magnetic saturation of the ferrite may be determined over a range of frequencies from the measured curves of resonance. ***T. S. Chu and R. G. Kouyoumjian.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S273-S278. (TK1 In6.6ap Vis.)

12303 Attenuation in Wedge and Septate Waveguides. Presents graphs of attenuation constants vs. frequency and vs. wedge angle for the wedge waveguide operating in its lowest mode. Presents results of an experimental determination of the attenuation constant which are in agreement with the calculated value. The losses do not become large as the wedge angle is allowed to approach zero and the attenuation constant of the septate waveguide compares favorably with that of standard waveguides. ***Robin M. Chisholm.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S279-S283. (TK1 In6.6ap Vis.)

12304 Diffraction of Nearly Plane 3.2-cm EM Waves by 45° and 90° Conducting Wedges. Comparison With Theory. Investigates diffraction of 3.2-cm microwaves when 45° and 90° conducting wedges were placed, in turn, in a beam with the diffracting edge on the axis of propagation and 5.5 meters from the apex of a pyramidal horn radiator, and with the beam incident on the forward "bright" surface of each wedge normally, and also at 45°. The incident field was polarized with the electric vector parallel to a diffracting edge. Field patterns for each case out to 7.5 λ (24 cm) from an edge have been observed along a line at right angles to the axis of propagation and on seven parallel lines at wavelength intervals further from the source. Agreement between experiment and theory is quite good in general in the central region of the field studied. Discrepancies that occur in certain regions are accounted for. ***N. E. Hedgecock and A. B. McLay.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S284-S287. (TK1 In6.6ap Vis.)

12305 The Matching of Parallel Dielectric Plates to Free Space. Studies phase shifts at the boundary discontinuities. While in some instances these phase shifts are of marginal significance, nevertheless they cannot be ignored in the design of a polarizer of the highest performance, or if the use of materials having a high dielectric constant is considered. Determines the scattering coefficients by the variational technique of Brown and Collin, using an artificial short. Their method is extended to each of the three types of discontinuity enumerated above. Uses a cosine series of two terms as a trial function. Formulas were developed to simplify the usual Weissfloch calculation. ***G. C. McCormick.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S288-S295. (TK1 In6.6ap Vis.)

12306 On the Propagation of Electromagnetic Waves Through Anisotropic Layers. ***G. Tyras and G. Held.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S296-S300. (TK1 In6.6ap Vis.)

12307 The Electromagnetic Field in a Randomly Inhomogeneous Medium. ***W. C. Hoffman.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S301-S306. (TK1 In6.6ap Vis.)

12308 Scattering by Quasi-Periodic and Quasi-Random Distributions. ***V. Twersky.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S307-S319. (TK1 In6.6ap Vis.)

12309 Modified WKB Methods for the Propagation and Scattering of Electromagnetic Waves. A new formulation of scattering and propagation problems has been developed, using Green's functions with essentially correct local behavior. This formulation, which is exact, yields the familiar WKB result as its zeroth approximation. Higher order corrections depend on the spatial variation of the local index of refraction. The convergence is rapid if these variations are gradual. Applies method to the propagation of electromagnetic waves in an isotropic stratified medium and to the scattering of waves by an inhomogeneity. The former case studies the problem of total reflection, as by the ionosphere, and obtains corrections to the usual WKB phase shift. These corrections arise as a consequence of deviations of the effective dielectric constant from linearity in the neighborhood of the turning point, and also because of the slow approach of the height-gain function to its asymptotic value far from the turning point. The latter example obtains approximate expressions for both the scattering amplitude and the close-in electric field which are valid when the index of refraction of the scattering center is close to unity. Examines polarization effects. ***D. S. Saxon.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S320-S323. (TK1 In6.6ap Vis.)

12310 Interaction of Electromagnetic Waves With Some Natural Surfaces. Describes the interaction by the differential scattering coefficients of the surface, in terms of which one may express such parameters of the surface as the radar cross section, the absorption coefficient, the albedo, etc. Obtains and uses general formulas for apparent surface temperature to calculate the apparent temperature of an asphalt roadway and a vegetation-covered surface. The predicted temperatures are found to be in reasonably good agreement with measurements of Britt, Tolbert, and Straiton at 4.3 mm wavelength. ***William H. Peake.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S324-S329. (TK1 In6.6ap Vis.)

12311 Electromagnetic Properties of High-Temperature Air. ***M. P. Bachynski, T. W. Johnston, and I. P. Shkarofsky.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S337-S339. (TK1 In6.6ap Vis.)

12312 The Propagation of Electromagnetic Waves in Ionized Gases. I. Introductory Theory. II. Propagation Along Stationary Columns. III. Propagation Along Moving Columns. Recent studies lend support to the theory that whistling atmospherics are caused by lightning flashes, the electromagnetic energy radiated by these being guided along discrete columnar ionic irregularities which follow approximately the lines of force of the earth's magnetic field. Sets forth the theoretical problems that arise and develops a general wave theory which is first applied to the problem of propagation through homogeneous compound streaming media. Examines the simplest case of "standard type" propagation along stationary columns, both for columns with a central ionic surplus and for columns with a central ionic deficiency. Although both types of columns can guide electromagnetic energy when sufficiently well developed, it appears that the former type is a much more likely mechanism for the whistler propagation than the latter. Attempts to show how a systematic theory might be developed for the case of axially moving columns. It is hoped in subsequent papers to further extend this theory and also to deal with propagation of a more general type of disturbances along the columns. ***F. H. Northover.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S340-S360. (TK1 In6.6ap Vis.)

12313 Antennas on Circular Cylinders. ***H. Lottrup Knudsen.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S361-S370. (TK1 In6.6ap Vis.)

12314 The Bandwidth of Helical Antennas. Shows that for a pitch angle Ψ equal to 13°, the normally accepted bandwidth of $0.77 < C\lambda < 1.25$, where $C\lambda$ is the circumference in terms of free-space wavelengths, is applicable only to antennas up to about two wavelengths long. A curve showing the bandwidth as a function of length has been computed, and the shape of this curve has been confirmed experimentally. Good patterns and axial ratio with sidelobe levels no greater than -10 db were obtained for helices as long as 10 wavelengths. Good patterns and axial ratio may also be obtained for Ψ as small as 2°, provided that the helix is sufficiently long to establish the surface wave. ***T. S. M. Maclean and R. G. Kouyoumjian.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S379-S386. (TK1 In6.6ap Vis.)

12315 Numerical Integration Methods for Antenna Pattern Calculations. ***Charles C. Allen.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S387-S401. (TK1 In6.6ap Vis.)

12316 A Resonance-Vocoder and Baseband Complement: A Hybrid System for Speech Transmission. Reviews speech contraints and their relevance to communication and points out the extent to which vocal and auditory constraints are applied in existing speech compression systems such as the Vocoder and the resonance-Vocoder. ***James L. Flanagan.*** *IRE Transactions on Audio*, v. AU-8, no. 3, May-June 1960, p. 95-102. (TK1 In6.6au Vis.)

12317 Realization of Minimum-Phase and Nonminimum-Phase Transfer Functions by RLC Ladder-Type Networks. Describes better control to the designer of unbalanced RLC networks that are to realize prescribed, minimum-phase or nonminimum-phase transfer functions. Maneuverability is achieved by introducing a set of "elementary sections", which are constructed from the individual factors of the prescribed transfer function. Rules for the interconnection of these sections are derived from an equivalent-network scheme which contains "generalized, ideal transformers", but mutual inductance is absent altogether from the synthesized networks. Effects of making certain decisions in the course of the design appear to be well predictable and easily traceable. ***Leo Storch.*** *IRE Transactions on Circuit Theory*, v. CT-7, no. 2, June 1960, p. 137-150. (TK1 In6.6c Vis.)

12318 Power Gain and Stability of Multistage, Narrow-Band Amplifiers Employing Nonunilateral Electron Devices. A theoretical problem of major interest in linear amplifier circuit theory is the problem of the interrelationships between gain and stability and gain and bandwidth of an amplifier, and their theoretical limitations as imposed by the active device parameters. ***Macrobio Lim.*** *IRE Transactions on Circuit Theory*, v. CT-7, no. 2, June 1960, p. 158-166. (TK1 In6.6c Vis.)

12319 Thin-Film Circuit Techniques. Discusses techniques used in producing thin-film circuits. Conductive, resistive and insulating films are evaporated separately onto glass substrates to form resistors, capacitors and interconnections. Active elements, transistors and diodes are mounted in holes drilled through the substrates. Studies aimed at developing thin-film active elements. ***John J. Bohrer.*** *IRE Transactions on Component Parts*, v. CP-7, no. 2, June 1960, p. 37-44. (TK1 In6.6cp Vis.)

12320 Transient Response of Variable Capacitance Diodes. A solution for the transient response of a reverse biased semiconductor diode to a step function (voltage) may be found by considering the junction essentially a voltage variable capacitance. The assumptions from which the analysis is made are given and found to be applicable in a wide variety of cases. Specific solutions are obtained for abrupt and linearly graded junctions, and experimental evidence is presented which is in good agreement with the derived equations. ***D. Schulz.*** *IRE Transactions on Component Parts*, v. CP-7, no. 2, June 1960, p. 49-53. (TK1 In6.6cp Vis.)

12321 Telemetry Receiving Antennas at Cape Canaveral. Erratic flights result in a change of polarization of the received wave to such an extent that the Cape Canaveral telemetry receiving antennas must have the capacity of receiving linearly-polarized waves that are horizontal, vertical, and all angles in between. At the present time, there are six of three-element helical antennas at Cape Canaveral that are used on all missile flights. ***H. A. Roloff.*** *IRE Transactions on Instrumentation*, v. I-9, no. 1, June 1960, p. 43-47. (TK1 In6.6i Vis.)

12322 A Six-Channel High-Frequency Telemetry System. A frequency-multiplex FM-AM system is described which provides six continuous channels via which waveforms with frequency components in the approximate band 10 cps to 10 kc may be simultaneously telemetered; extension of the frequency coverage to include the band 0-10 lp cps is achieved by the use of commutated reference levels. A radio frequency in the 465-mcs band and subcarrier frequencies between 250 and 500 kc are used. ***T. C. R. S. Fowler.*** *IRE Transactions on Space Electronics and Telemetry*, v. SET-6, no. 2, June 1960, p. 69-81. (TK1 In6.6r Vis.)

12323 The Effect of Different Types of Video Filters on PDM-FM and PCM-FM Radio Telemetry. It is found that minimum allowable pulse height controls the minimum allowed bandwidth of the Gaussian filter and if crosstalk suppression of 50 to 60 db is required, crosstalk controls the minimum allowed bandwidth of the ILPF. ***M. H. Nichols and A. T. Bublitz.*** *IRE Transactions on Space Electronics and Telemetry*, v. SET-6, no. 2, June 1960, p. 85-92. (TK1 In6.6r Vis.)

12324 Impulse Noise Reaction Circuit for Communication Receivers. Suggests a comparatively simple scheme for reducing the impulse noise, which consists of a gating signal generator and a balanced gate. It functions as follows: the impulse noise in the antenna triggers the gating signal generator. This generator produces a gating signal which in turn controls a balance gate. ***W. F. Chow.*** *IRE Transactions on Vehicular Communications*, v. VC-9, no. 1, May 1960, p. 1-9. (TK1 In6.6v Vis.)

12325 The New Trend in Minified Communications Equipment. Describes the Micro-Module building-block and the current program status in terms of both up-to-date hardware accomplishments and future consideration, particularly in the area of miniaturized communications equipment. ***J. W. Knoll.*** *IRE Transactions on Vehicular Communications*, v. VC-9, no. 1, May 1960, p. 25-32. (TK1 In6.6v Vis.)

12326* An Introduction to the Theory of Solid-State Masers. The relevant properties of paramagnetic ions are described and the quantum theory of maser action is outlined qualitatively. A semiclassical treatment is developed which is based on the classical equation of motion of a magnetic dipole. ***P. N. Butcher.*** *Institution of Electrical Engineers, Proceedings*, v. 107, pt. B, no. 34, July 1960, p. 341-353.

12327* Extra-Terrestrial Radio Noise as a Source of Interference in the Frequency Range 30-1000 Mc/s. Presents published information on the intensity of noise from the galaxy, the sun and from other extra-terrestrial sources in a form which shows their importance relative to the internal noise of typical receiving installations. Particular attention is paid to a half-wave horizontal dipole aerial and to an aerial with a 20° pencil beam directed horizontally. ***F. Horner.*** *Institution of Electrical Engineers, Proceedings*, v. 107, pt. B, no. 34, July 1960, p. 373-376.

12328 The Long-Term Stability of Fixed Resistors. Some reported life tests have proceeded without interruption for almost four years. Carbon-composition resistors under load fail by slow thermal degradation of the resistive material. Vitreous-enameled wire-wound resistors made with fine wire may fail during tropical exposure. High-stability cracked-C resistors may fail rapidly under light. Tests for long-term resistor stability are discussed. ***H. F. Church.*** *Institution of Electrical Engineers, Proceedings*, v. 107, pt. B, no. 34, July 1960, p. 377-385.

12329 Power Flow and Stored Energy in Thin Electron Beams. The kinetic and electromagnetic components of ac power and stored energy are evaluated for space-charge waves along thin drifting beams of simple geometry. It is found that: when a modulated beam is decelerated, it radiates power into the surrounding space; when both fast and slow waves are excited by a common source, the real kinetic power varies periodically with distance, exchanging energy with the electromagnetic field; and when a finite-area beam is current modulated with zero ac velocity, the total power need not be zero. ***W. W. Rigrod.*** *Journal of Applied Physics*, v. 31, July 1960, p. 1147-1153.

12330* Space-Charge Wave Parametric Amplifiers. An electron beam which is velocity modulated in the form of a fast space-charge mode at frequency ω, called the pump frequency, will parametrically amplify a signal at frequency ω_1 which is applied to the beam in the form of a fast space-charge wave at ω_1. Although in principle fast mode noise can be removed from the beam, it would be extremely awkward to attempt removal at very many of these idler frequencies. It is found that noise from all higher idler frequencies is periodically transferred between the beam and helix although it grows exponentially. ***J. S. Cook and W. H. Louisell.*** *Journal of Electronics and Control*, v. 8, no. 1, Jan. 1960, p. 1-18.

12331* The Electronic Admittance of a C.W. Magnetron Oscillator. In the past, great labor was involved in making electronic-admittance measurements and results exhibited a high degree of experimental error. This report presents a new measurement method which is both rapid and accurate. It is applied

to the Raytheon QK582, and X-band, C.W., 200-watt magnetron. Measurements cover a wide range of operation. Results show that the electronic susceptance is always positive (capacitive). ***Carlton G. Lehr and Agris J. Kalnajs.*** *Journal of Electronics and Control,* v. 8, no. 1, Jan. 1960, p. 19-37.

12332* Surface Studies on p-n Junctions. It is found experimentally for Si that the magnitude of the junction reverse current alters when the surface potential changes, for instance, as a result of exposure of sulfur dioxide or diethylamine, but that this change is not due primarily to a change in activation energy, which remains unchanged as it is governed by the underlying bulk states. ***I. Stelzer.*** *Journal of Electronics and Control,* v. 8, no. 1, Jan. 1960, p. 39-57.

12333* Harmonics From a Microwave Gas Discharge. Harmonic power from a 10 cm wavelength glow discharge in neon has been detected down to 6 mm wavelength (18th harmonic). The fundamental power is fed from the waveguide to a coaxial line terminated by the discharge tube. A second smaller waveguide is coupled to the coaxial line to extract the harmonic measured). A typical conversion loss from 10 cm to conversion loss appears to fall off by only 3-4 dB per harmonic after an initial drop of 35 dB to the third harmonic (lowest harmonic measured). A typical conversion loss from 10 cm to 8 mm (12th harmonic) is 63 dB, e.g., 20 kw input, 10 mw output. In general, the output power increases with input power until arcing in the mount spoils the measurement. A pressure range of 5-39 mm Hg was used. ***N. R. Bierrum and D. Walsh.*** *Journal of Electronics and Control,* v. 8, no. 2, Feb. 1960, p. 81-90.

12334* Analysis of the Effects of Multiply-Charged Impurities in Semiconductors by the Mass Action Law. The mass action law is used to derive expressions for the equilibrium carrier concentration and net steady-state recombination rate in a semiconductor containing impurities capable of being multiply-ionized. The results are in agreement with those found by other treatments and can easily be modified to apply to the degenerate case. ***N. H. Saunders.*** *Journal of Electronics and Control,* v. 8, no. 2, Feb. 1960, p. 91-96.

12335* Concerning the Importance of Momentums for Time and Frequency Functions. Definitions for the momentums and their functional laws are given. The relationship between momentums and pulse shape on one hand and frequency functions on the other is derived. Results show that practically the momentums are very adequate pulse parameters if one succeeds in generalizing them for the case of oscillating time functions. (*In German.*) Über die Bedeutung der Momente für Zeit- und Frequenzfunktionen. ***H. Dobesch and H. Sulanke.*** *Nachrichtentechnik,* v. 10, no. 6, June 1960, p. 240-246.

12336* Reflex Klystrons for Wavelengths of 4 and 2.5 mm. Reflex klystrons for mm wavelengths are mainly used in radar receivers, waveguide communication systems, and for various research purposes, e.g., for microwave spectroscopy and temperature measurements on gas-discharge plasma (from the propagation properties of microwaves in a plasma one can derive the electron density and temperature of the plasma). The latter application is of especial importance in that it allows the determination of the enormously high gas temperatures, of the order of millions of °K, required to initiate thermonuclear reactions. ***B. B. van Iperen.*** *Philips Technical Review,* v. 21, no. 8, June 1960, p. 221-228.

12337* Application of Radioactive Isotopes to the Study of Processes in an Oxide Cathode and Some Other Problems of Cathode Electronics. Radioactive isotopes were used in studying metal evaporation, reciprocal diffusion of metals, diffusion of Ni and Ba in the coating of an oxide cathode, the distribution of substance of a getter flash and of the evaporating substance of different parts of a commercial lamp according to its elements, etc. This method is the only one permitting a qualitative and quantitative evaluation of the processes. (*In Russian.*) Primenenie radioaktivnykh izotopov k izucheniiu protsessov v oksidnom katode i nekotorym drugim voprosam katodnoĭ elektroniki. ***G. N. Shuppe and V. P. Vasil'ev.*** *Radiotekhnika i Elektronika,* v. 5, no. 7, July 1960, p. 1135-1144 + 1 plate.

12338* Effects of Modulation of Thickness of a Collector p-n Junction Upon the Operating Conditions of a Semiconductor Triode Oscillator. The averaged capacity corresponding to the first harmonic voltage component of a collector junction increases with the increase of the amplitude of the oscillations. In determining the conditions, this guarantees soft conditions in the generator of quasi-harmonic oscillations on the semiconductor triode with a general basis within the range of the ultrasonic and higher frequencies. (*In Russian.*) Vliianie moduliatsii tolshchiny kollektornogo p-n-perekhoda na rezhim generatora s poluprovodnikovym triodom. ***L. N. Kaptsov.*** *Radiotekhnika i Elektronika,* v. 5, no. 7, July 1960, p. 1165-1172.

12339 Solid State Physics in Electronics and Telecommunications. I. Magnetic and Optical Properties. Proceedings of an International Conference held in Brussels, June 2-7, 1958. Ferrites, properties of magnetic materials, applications of magnetic materials, garnets and magnetic resonance are discussed. ***M. Désirant and J. L. Michiels, editors.*** v. III. 557 pp. 1960. Academic Press, New York. (TK7872.S4 So44)

12340 Statistical Methods in Radio Wave Propagation. Proceedings of a symposium held at the University of California, Los Angeles, June 18-20, 1958. Discusses problems concerning statistical theory and methodology, radio propagation, phenomenology and instrumentation for processing radio propagation data. ***W. C. Hoffman, editor.*** 334 pp. 1960. Pergamon Press, New York. (QC665 C12s)

12341* Note on a Test of the Equivalence Theorem for Sporadic *E* Propagation. Analysis of two days (123 cases) of sporadic *E* observed simultaneously at oblique and vertical incidence verifies that the classical sec ϕ relationship between top frequencies is roughly appropriate for sporadic *E*. ***J. W. Wright and T. N. Gautier.*** *U. S. National Bureau of Standards, Journal of Research, Section D, Radio Propagation,* v. 64D, no. 4, July-Aug. 1960, p. 347-348.

See also: **12414** (probing nature with electronics); **12419** (scattering by meteor trails).

ENGINEERING ECONOMICS

12342 Keys to Small Company Success. How one little firm struggled with problems in big business world. Its decisions—right and wrong—will help to steer the course to profitable expansion. ***Fred Ziman.*** *Food Engineering,* v. 32, July 1960, p. 35-37.

12343* Will U. S. Give Industry a Break on Depreciation? Industry's long struggle for better tax treatment on new production equipment appears to be coming to a head. There is new backing for the business viewpoint, both inside and outside of government. ***Stanley E. Cohen.*** *Industrial Marketing,* v. 45, Aug. 1960, p. 114 + 3 pages.

12344 Ratio Analysis: A System That Controls Production Profits. Sound analysis plays a vital role in predicting profits. The day has passed when a production manager is able to make safe judgments from data available at his fingertips. ***S. A. Tucker.*** *Iron Age,* v. 186, no. 3, July 21, 1960, p. 136-138.

12345 Industry Can Make Greater Use of Commerce Field Services. This year the 33 field service offices of the Dept. of Commerce will handle over a million requests from business for aid. Field service officials believe they can do a great deal more for industry—if asked. ***P. J. Cathey.*** *Iron Age,* v. 186, no. 6, Aug. 11, 1960, p. 149-150.

12346 Wages and Taxes in W. Europe. Wage costs are generally lower in W. Europe than in the U.S. The differences are not as great as those at first glance; taxes are lower. Direct comparisons are difficult to make. ***J. J. Thackara.*** *Iron Age,* v. 186, no. 6, Aug. 11, 1960, p. 152-154.

12347* New Concepts of the Learning Curve. Basic cost curves, the unit of learning, learning shifts, and the S-curve are discussed. ***E. B. Cochran.*** *Journal of Industrial Engineering,* v. 11, no. 4, July-Aug. 1960, p. 317-327.

12348 The Management of Corporate Capital. Discusses measuring investment worth, the cost of debt and equity funds, general solutions to optimal investment decisions, and special

aspects of capital measurement. Cites discount tables and classified bibliography. ***Ezra Solomon, editor.*** 3rd ser. 327 pp. 1959. The Free Press of Glencoe, Chicago, Ill. (HG4011 So47m)

12349* Wold Population and World Resources. I. The Problems to Be Faced. Are the Earth's natural resources sufficient to meet the needs of its swiftly growing population—and the demands of underdeveloped communities for higher living standards? Aspects of this question will be examined by several authors in a series of articles of which this is the first. ***John Russell.*** *New Scientist*, v. 8, July 21, 1960, p. 208-210.

12350 Problems Resulting From Population Growth. A symposium presented at the Ohio Academy of Science at Capital University, Apr. 18, 1959. ***Jorgen M. Birkeland, et al.*** *Ohio Journal of Science*, v. 60, no. 4, July 1960, p. 207-230.

12351 Problems Resulting From Population Growth. Can Technology Solve the Materials-Needs Problem of the World? A factor of 25 seems to be the extreme upper limit which is conceivable for the future as far as food production is concerned; the world population might go to 200 billion, but more likely 100 billion is the maximum possible limit. The limiting factors for the next hundred are not the materials-need factors alone but the social, political, and economic factors. These are major for any increase in the world population. ***Alfred B. Garrett.*** *Ohio Journal of Science*, v. 60, no. 4, July 1960, p. 218-224.

12352* Budgeting Your Way to Profits. Pertinent pointers on an important business procedure from an accountant who is also an authority on taxation. ***Paul Sage.*** *Pit and Quarry*, v. 53, no. 2, Aug. 1960, p. 109-110.

12353 A Short Introduction to the Economy of Latin America. Population, agriculture, forestry and fisheries, oil and other minerals, transport and power, manufacturing, international trade, prospects, recent economic trends in Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela are discussed. ***F. Benham and H. A. Holley.*** 169 pp. 1960. Oxford University Press, New York. (HC161 B43s)

12354* Are Your Supply Costs Soaring? Remind the employees now and then not to make extravagant use of the "small" items. *Textile Industries*, v. 124, Aug. 1960, p. 144-145.

12355 The U.S. Industrial Outlook for 1960. Chemicals and applied products, communications, construction-building materials, consumer products and services, containers and packaging, forest products, machinery and equipment, metals and minerals are discussed. 304 pp. 1960. United States Department of Commerce, Washington, D. C. (HC106.5 Un3.1u)

See also: **12413** (economics of slimhole drilling); **12420** (Illinois fluorspar production).

FLUID MECHANICS

12356 Microwave Absorption and Molecular Structure in Liquids. XXX. The Anomalous Dielectric Relaxation of Diphenyl Ether and Some Similar Molecules. ***D. M. Roberti, O. F. Kalman, and C. P. Smyth.*** *American Chemical Society, Journal*, v. 82, July 20, 1960, p. 3523-3526.

12357* An Analysis of Critical Simultaneous Gas/Liquid Flow Through a Restriction and Its Application to Flow-Metering. Shows that a relationship exists between the mass flows of gas and liquid, restriction size and upstream pressure. Comparison of this relationship with measurements showed a reasonable agreement. Concludes that a restriction can be used as a gas/liquid flowmeter with reasonably high accuracy, provided that the flow is a critical one. ***N. C. J. Ros.*** *Applied Scientific Research, Sec. A, Mechanics, Heat, Chemical Engineering, Mathematical Methods*, v. 9, no. 5, 1960, p. 374-388.

12358* A New Theory of Fluids: The "Tunnel" Model. Based on a model in which lines of molecules move almost one-dimensionally in "tunnels", the walls of the tunnels being formed by neighboring lines of molecules. This picture is related to the "cell" model, but it is a disordered picture, as is appropriate in a model for fluids, and the problem of the "communal entropy" which besets the cell model, does not arise. ***J. A. Barker.*** *Australian Journal of Chemistry*, v. 13, no. 2, May 1960, p. 187-193.

12359* The Methodology of Viscosity Measurement. The most important types of flow are capillary flow, couette flow, flow in wedge-shaped slits between two coaxial conical surfaces, and the flow around a sphere moving in a straight line. Discusses several types of viscometers which present specially interesting construction. (*In German.*) Zur Methodik der Viscositätsmessung. ***S. Peter.*** *Chemie-Ingenieur-Technik*, v. 32, July 1960, p. 437-447.

12360 The Chemical Effects of Pressure. VI. The Electrical Conductivity of Several Liquids at High Shock Pressures. Water, methyl alcohol, acetic acid, propionic acid, and a 1:1 mixture of water and ethyl alcohol all became good conductors at shock pressures of about 100,000 atm. ***H. G. David and S. D. Hamann.*** *Faraday Society, Transactions*, v. 56, July 1960, p. 1043-1050.

12361 A Friction Factor Plot for Smooth Circular Conduits, Concentric Annuli, and Parallel Plates. ***John Lohrenz and Fred Kurata.*** *Industrial and Engineering Chemistry*, v. 52, Aug. 1960, p. 703-706.

12362 Mechanics of Secondary Water-Hammer Waves. Special experimental arrangement prevented the appearance of irregularities called secondary waves, during the first surge, which helped considerably in the theoretical exposition. ***Y. K. Gayed and M. Y. M. Kamel.*** *Institution of Mechanical Engineers, Proceedings*, v. 173, no. 26, 1959, p. 675-683.

12363* Longitudinal Flowing of Highly Viscous Fluid Around a Heated Cylinder. Results given of experimental investigations on the transfer of heat from wires heated by an electric current, when a highly viscous fluid is flowing round them longitudinally. (*In Russian.*) Prodol'noe obtekanie nagretogo tsilindra vysokoviazkoĭ zhidkost'iu. ***A. Sh. Asaturian and B. A. Tonkoshkuov.*** *Inzhenerno-Fizicheskiĭ Zhurnal*, v. 3, no. 7, July 1960, p. 106-111.

12364* Functional Relationship Between the Viscosity of Liquids and Their Structure. A normal variation of the coefficient of viscosity as function of temperature, critical temperature or boiling temperature of the liquid at a normal pressure, critical density, molecular weight and number of n-particles entering in the composition of the molecular group was found. (*In Russian.*) O zavisimosti viazkosti zhidkosteĭ ot ikh struktury. ***Kh. M. Khalilov.*** *Izvestiia Vysshikh Uchebnykh Zavedeniĭ, Neft' i Gaz*, v. 3, no. 7, 1960, p. 97-103.

12365* Rheological Properties of Glycerine Solutions. The elasto-viscous properties of glycerine containing various amounts of water were investigated by measuring the flow curves on a highly sensitive elasto-viscometer according to Rehbinder's method. Shows that the system is not a Newtonian fluid, for its rheological properties are similar to an elastic fluid. (*In Russian.*) Reologicheskie svoĭstva rastvorov glitserina. ***I. A. Dumanskiĭ and L. V. Khaĭlenko.*** *Kolloidnyĭ Zhurnal*, v. 22, no. 3, May-June 1960, p. 277-281.

12366 The Marangoni Effects. Cause of, and resistance to, surface movements; surface elasticity and viscosity in liquids. ***L. E. Scriven and C. V. Sternling.*** *Nature*, v. 187, July 16, 1960, p. 186-188.

12367* Contribution to the Investigation of the Effect of a Jet of Gas on the Free Surface of a Liquid. Effects caused by a vertical airjet on the surface of a volume of water in a cylindrical vat. Describes different deformations of the liquid surface, and calculates depth and width of the impression, which forms under the jet in the result of air flow, and which depends on the distance of the nozzle from surface of water and on diameter of nozzle. (*In French.*) Contribution a l'étude de l'aciton d'un jet gazeux sur la surface libre d'un liquide. ***F. Mathieu.*** *Revue Universelle des Mines*, v. 16, ser. 9, July 1960, p. 309-321.

12368 The Structure of Liquids. New geometrical analysis shows that there is some order in the disorderly arrangements of the molecules of a liquid. The method may lead to a general

theory of the liquid state. ***J. D. Bernal.*** *Scientific American*, v. 203, no. 2, Aug. 1960, p. 125 + 6 pages.

12369* The Rheology of Pastes, Suspensions and Emulsions. Discusses effects of concentration changes in viscosity and complex flow properties of emulsions, suspensions and pastes. Many systems are softened temporarily (thixotropy) or permanently (rheodestruction) by shearing, while some are hardened and some also "dilate". Describes measurements of stickiness and thread-forming capacity. Considers use of multivariate analysis for simplifying large batches of complex data. ***G. W. Scott Blair.*** *Society of Cosmetic Chemists, Journal*, v. 11, no. 4, May 1960, p. 181-191.

12370* Method of Visualization of Gaseous Media Flows. Flakes of metaldehyde, introduced as tracers into an airflow, show flow conditions. Conditions indicated by the flakes can be evaluated by photography and motion pictures. Describes production of metaldehyde flakes and their properties. (*In German.*) Methode zur Sichtbarmachung von Strömungen gasförmiger Medien. *Technik*, v. 15, June 1960, p. 432-433.

12371 Transactions of the Society of Rheology, 1959. Fourteen papers presented at the Annual Meeting of the Society, held at the Franklin Institute in Philadelphia, Penna., on Nov. 5-7, 1958. ***R. D. Andrews, editor.*** v. III. 216 pp. 1960. Interscience Publishers, Inc., New York. (QC189 So13tH Vis.)

12372* On the Conductance of Systems for Molecular Flow of Gases. The general formula giving the conductance of circular and annular apertures is demonstrated on a physical basis. The case when the inlet of a tube protrudes into a vessel is mentioned. Discusses conclusions of essential importance in calculating conductances of composite systems and presents formulae for various cases. ***N. A. Florescu.*** *Vide*, v. 15, no. 87, May-June 1960, p. 197-209.

See also: **12046** (Heat Transfer and Fluid Mechanics Institute, Proceedings).

FOOD TECHNOLOGY

12373 Food Chemistry. Provides a unified picture of foods from a chemical standpoint. The primary emphasis is on the composition of foods and the changes that occur when they are subjected to processing. ***Lillian Hoagland Meyer.*** 385 pp. Reinhold Publishing Corp., New York. (TP370 M57f)

12374* The Effect of Dietary Magnesium and Thyroxine on Progression and Regression of Cardiovascular Lipid Deposition in the Rat. Young male rats were fed an "atherogenic" diet (containing cholesterol and cholic acid) and two levels of dietary Mg. Rats fed low-dietary Mg had a heart valve-aorta score (vascular lipidosis) of 4.8 at 24 days and a slightly higher heart score at the end of 60 days. Animals fed high-Mg diets had a heart score of only three after 24 days which was lowered to 1.5 at the end of 60 days. Feeding high dietary Mg appeared to result in some regression of vascular lipidosis as well as to exert an "anti-sudanophilic" effect. The addition of thyroxine to the diet caused a definite regression in vascular sudanophilia. ***Motoomi Nakamura, Joseph J. Vitale, D. Mark Hegsted, and Earl E. Hellerstein.*** *Journal of Nutrition*, v. 71, no. 4, Aug. 1960, p. 347-355.

12375* Observations on the Influence of Vitamin B_{12} and Folic Acid on Protein Utilization in the Growing Rat. The low efficiency of peanut protein in comparison with casein was improved with supplements either of vitamin B_{12} or folic acid. For optimal effects, supplementation with both vitamins was essential. ***Prema Fatterpaker, et al.*** *Journal of Nutrition*, v. 71, no. 4, Aug. 1960, p. 371-378.

12376* Nutritive Value of a Protein Digest Made From Oil Cakes. The cake hydrolysate was found to sustain the growth of albino rats with the same degree of efficiency as casein. The cake hydrolysate also stimulates the synthesis of amylase by pigeon pancreas under aerobic conditions, indicating that the amino acids present in the hydrolysate are available for protein synthesis. ***Chanan Singh and C. R. Krishna Murti.*** *Journal of Scientific & Industrial Research*, v. 19B, Apr. 1960, p. 87-89.

12377 Protein Resources. A general review of the shortage of protein foods and means of alleviation. ***A. E. Bender.*** *Research Applied in Industry*, v. 13, July 1960, p. 270-274.

FUELS AND COMBUSTION

12378 American Gas Association. Forty-First Annual Convention. Discusses Western Canada—a major natural gas source, America's energy requirements, foaming agents for removal of liquid from gas wells, and other problems. 238 pp. 1959. American Gas Association, New York. (TP700 AM35p Vis.)

12379 Astronautics Data Sheet—Propellants. Properties of monomethyl hydrazine (MMH)—($CH_6N_2H_3$). ***Stanley Sarner, compiler.*** *Astronautics*, v. 5, July 1960, p. 86.

12380 Combustion of Eastern Canadian Coal in Thin Fires on a Spreader-Fired Air-Cooled Oscillating Grate. Investigated on a Riley spreader-fired air-cooled oscillating grate. The grate proved to be efficient, automatic, and satisfactory for burning Dominion coal. Clinkering and excessive smoke can be minimized by burning in thin fires. Thin firing overheats the grate, but this can be controlled by distribution of the combustion air. ***E. R. Mitchell, F. D. Friedrich, and G. A. Gauthier.*** *Canada, Mines Branch, Technical Bulletin TB* 1, July 1959, 61 pp. (TN26 C16.5tb Contin.)

12381 Relationship of Various Factors to the Quality of Coked Briquets Made From Mixtures of Coking Coals and Inert Material. ***E. Swartzman.*** *Canada, Mines Branch, Technical Bulletin TB* 6, Sept. 1959, 20 pp. (TN26 C16.5tb Contin.)

12382 The Chemistry of Propellants. A meeting organized by the AGARD Combustion and Propulsion Panel, Paris, France, June 8-12, 1959. Covers propellant sources and costs, liquid propellants, solid propellants, propellants for air-breathing engines, selected basic studies, and discussions on basic problems in propulsion. ***S. S. Penner and J. Ducarme, editors.*** 651 pp. 1960. Pergamon Press, New York. (TL782 N81.1c)

12383* The Durgapur Coking Plant. The first part of a detailed description of the metallurgical coke plant and the byproducts plant serving the iron-works. *Coke and Gas*, v. 22, July 1960, p. 286-292.

12384 The Collection, Monitoring and Identification of Particles in Gas Distribution Systems. The following instruments are of high value for collecting samples: the cascade impactor, the Millipore filter, the thermal precipitator, and the absolute filter. Describes operating conditions and procedures. ***A. W. Doyle, W. J. Smith, and N. M. Wiederhorn.*** 145 pp. 1959. American Gas Association, New York. (TP754 L72c)

12385* ASA Standards for Pulverized Fuel Systems. Presents the complete new Code Z12.7-1959 for the installation and operation of pulverized fuel systems, in the interest of improved safety and availability. *Combustion*, v. 32, no. 1, July 1960, p. 26-36.

12386* Liquid Petroleum Gases as Fuels for Automotive Engines. New markets, particularly seasonal ones, are required to utilize butane and propane locally. Research was directed to automotive use, since farm engines equipped to burn these fuels could take some of the acute summer surplus. ***H. A. Spencer.*** *Engineering Journal*, v. 43, July 1960, p. 62-65.

12387* Chemical Structure and Properties of Coal. XXVII. Composition and Molecular Weight Distribution of Coal Extracts. ***H. N. M. Dormans and D. W. van Krevelen.*** *Fuel*, v. 39, no. 4, July 1960, p. 273-292.

12388* Chemical Properties of Coal Macerals. I. Introductory Survey, and Some Properties of Exinites. Concludes that exinites do not differ greatly from vitrinites in their principal chemical characteristics. ***P. H. Given, M. E. Peover, and W. F. Wyss.*** *Fuel*, v. 39, no. 4, July 1960, p. 323-340.

12389* The Production and Use of Gas in Connection With Purity of the Air. Discusses the conventional production of gas, production of gas by cracking crude oil products, use of gas and legal regulations. Covers different poison gases, dusts and vapors, developed in gas production. (*In German.*) Gaserzeugung und Gasverwendung im Hinblick auf die Reinhaltung der Luft. ***Helmut Pichler.*** *GWF; Gas- und Wasserfach* (Gas), v. 101, no. 27, July 1, 1960, p. 681-688.

12390 Coal. What Every Engineer Should Know. A question-and-answer series covering the properties of this heat source. ***Willie Hammer.*** *Heating, Piping & Air Conditioning*, v. 32, Aug. 1960, p. 132-134.

12391 Desulfurization of Petroleum Coke. Process consists of: pulverizing the coke to pass a 60-mesh screen; adding an alkaline reagent; calcining; cooling, leaching with water; drying. ***Sigmund J. Lukasiewicz and George C. Johnson.*** *Industrial and Engineering Chemistry*, v. 52, Aug. 1960, p. 675-677.

12392 Oil Shale Pyrolysis. ***Charles H. Prien.*** *Industrial and Engineering Chemistry*, v. 52, Aug. 1960, p. 720-723.

12393* The Use of Milled Peat in Large Boilers for the Generation of Electricity. The object was to achieve rapid ignition at burner level with low enough furnace temperature to prevent slagging, and with a long enough flame to burn the fibrous materials. ***J. F. Cullen.*** *Institute of Fuel, Journal*, v. 33, July 1960, p. 317-328 + 3 plates.

12394* Discussion on "Comparison of Different Methods of Fluid-Atomizing Oil Flames and the Effect on Flame Emissivity and Radiation of the Addition of Carbon Black to Liquid Fuels". Meeting of Institute of Fuel in London, Feb. 24, 1960. *Institute of Fuel, Journal*, v. 33, July 1960, p. 344-353 + 2 plates.

12395 Natural Gas Supplements by Cyclic-Regenerative Hydrogasification of Oils. A study of high-Btu oil gas production by cyclic thermal cracking of petroleum oils. Experimental data were obtained with a pilot-size four-shell cyclic-regenerative oil gas set of improved design. The use of process H improved gasification results. Production of H as an integral part of the process, by steam reforming of natural gas over Ni catalysts, also was studied. ***J. M. Reid, W. G. Bair, and H. R. Linden.*** *Institute of Gas Technology, Research Bulletin No.* 28, Mar. 1960, 78 pp. (TP700 In7r Vis.)

12396* Effects of Lead and Copper Naphthenates on the Destruction of Polymers in Concentrated Oils. Effects were studied in connection with the change in viscosity of turbine oil 22L, thickened by means of polymethacrylate, "Vinipole" and polyisobutylene at 150 C in air, O, and N. Lead naphthenate destroys the polymers in O and air. Copper naphthenate is less active in this regard and retards the destruction of "Vinipole". (*In Russian.*) Vliianie naftenatov svintsa i medi na destruktsiiu polimerov v zagushchennykh maslakh. ***S. Z. Kaplan, V. K. D'iakov, and N. I. Chuprik.*** *Khimiia i Tekhnologiia, Topliv i Masel*, v. 5, no. 7, July 1960, p. 38-42.

12397* Clinkering Tendency of Coals. There is a fully normal relationship between the clinkering tendency of coals and the maximum yield of chloroform extract after their preliminary heating. Slight hydrogenation improves the clinkering capacity; oxidation is detrimental. (*In Russian.*) Spekaemost' ugleĭ. ***Samir Sarkar.*** *Koks i Khimiia*, 1960, no. 7, p. 17-24.

12398* Effects of Coking Velocity and of the Apparent Density on Coke Quality. The cracks in coke and its fines depend on the energy communicated to the coal mass. The energy can be expressed mathematically as the product of bulk weight and of coking velocity. In a series of tests in semi-technical coking furnaces, the weight and velocity in question were modified. Results were represented by means of tables and diagrams and agree with the theory. (*In Czech.*) Vliv rychlosti koksování a sypné váhy na jakost koksu. ***J. Kunc and Vl. Charvát.*** *Paliva*, v. 40, no. 6, June 1960, p. 181-186.

12399 Proceedings of the Propellant Thermodynamics and Handling Conference. Papers pertain to: The computation of equilibrium exhaust-product composition and performance of liquid rocket propellant systems by machine digital computers; the basic physical and thermodynamic data of liquid propellants and their combustion products; and the thermodynamic analysis of processes in rocket engines. The propellant handling area had papers covering such aspects as materials problems, handling techniques, and safety; toxicity of high-energy and cryogenic liquid propellants and their combustion products were accepted as being in the propellant thermodynamics area. Cover B, H, F, and O as used in rocketry. Safety is stressed. ***Loren E. Bollinger and Alexis W. Lemmon, Jr., editors.*** 590 pp. 1960. Engineering Experiment Station, Ohio State University, Columbus, Ohio. (TL785 P94p)

12400* Thermal Decomposition of Liquefied Petroleum Gas With Recirculation of the Olefin-Free Gas After Pyrolysis. Recirculation permits a considerable increase in the yield of the total amount of olefins. Dilution with inert gases had an insignificant effect on the thermal decomposition of propane and butanes. (*In Polish.*) Rozkład termiczny gazolu z recyrkulacją odolefinowanego gazu popirolitycznego. ***Tadeusz Mazoński and Marian Taniewski.*** *Przemysł Chemiczny*, v. 39, no. 5, May 1960, p. 303-306.

12401 Absorption Spectra of Low-Pressure Flames. Absorption spectra of flames, which have a relatively thick reaction zone, were studied by means of a multiple-reflexion system to increase the effective path length in the gases. To obtain a background source of sufficient brightness to reverse the absorption bands, a flash tube and rotating sector device was employed. Rich-limit low-pressure flames of ethers and aldehydes show formaldehyde absorption. ***A. G. Gaydon, G. N. Spokes, and J. van Suchtelen.*** *Royal Society, Proceedings*, v. 256, ser. A, July 5, 1960, p. 323-333 + 1 plate.

12402 Possibilities of Using Nuclear Energy for Gasifying Coal. Preliminary calculations show an economic advantage in using nuclear energy to supply the endothermic heat required for gasifying coal. The proposed system for gasification is the indirect process cycle with He heated in a nuclear reactor and passed through an exchanger-type gasifier for the reaction of coal and steam to form CO and H_2. ***James P. McGee and Sidney Katell.*** *U. S. Bureau of Mines Information Circular* 7965, 1960, 11 pp. (TN21 Un3i Room 290)

12403 Photomicrographic Tracking of Ethanol Drops in a Rocket Chamber Burning Ethanol and Liquid Oxygen. A 2-inch-diameter by 16-inch-length rocket combustor was used with liquid O as the oxidant. Drop-size-distribution data for the breakup of ethanol jets inside the combustor were obtained from photomicrographs of the spray taken four inches downstream from the injector face. ***Robert D. Ingebo.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN-D-290*, June 1960, 18 pp. (TL570 Un3t Vis.)

See also: **12600** (blast furnace gas cleaning plant).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

12404* Acoustic Measurements in Deep Water Using the Bathyscaph. ***Morton Lomask and Roberto Frassetto.*** *Acoustical Society of America, Journal*, v. 32, Aug. 1960, p. 1028-1033.

12405* On a Petrographic Interpretation of Geophysical Data on the Structure of the Earth's Crust. (*In Russian.*) O petrograficheskoĭ interpretatsii geofizicheskikh dannykh o stroenii zemnoĭ kory. ***G. D. Afanas'ev.*** *Akademiia Nauk SSSR, Izvestiia, Seriia Geologicheskaia*, 1960, no. 7, July, p. 3-31.

12406* Vertical Distribution of Atmospheric Ozone. Comparison of Different Methods. (*In French and English.*) Distribution verticale de l'ozone atmosphérique. Comparaison de diverses méthodes. ***A. W. Brewer, H. U. Dütsch, J. R. Milford, M. Migeotte, H. K. Paetzold, F. Piscalar, and E. Vigroux.*** *Annales de Géophysique*, v. 16, no. 2, 1960, p. 196-199.

12407* On the Existence of a General Corpuscular Field From the Sun. Gives a general definition of the source of corpuscles responsible for M-disturbances. The acceleration of gases in cometary tails is produced by magnetic fields frozen in corpuscular condensations. (*In Russian.*) O nalichii obshchego

polia korpuskul iz solntsa. ***E. R. Mustel'.*** *Astronomicheskii Zhurnal*, v. 37, no. 3, May-June 1960, p. 396-402.

12408* The Plugging Effect of Bacteria in Sandstone Systems. Above was investigated by injecting various concentrations of dead bacteria cells through sandstone cores. Results indicated that rock permeability has little effect on plugging. ***R. T. Hart, T. Fekete, and D. L. Flock.*** *Canadian Mining and Metallurgical Bulletin*, v. 53, no. 579, July 1960, p. 495-501.

12409* Diamond Drilling Bit Lubricant. ***Paul G. Varley.*** *Canadian Mining Journal*, v. 81, July 1960, p. 54.

12410* Yttrium and Ytterbium. With the rapid advances in rocketry and creation of nuclear energy, these rare metals are being re-investigated as to their possible use in these and other fields. ***L. Sanderson.*** *Canadian Mining Journal*, v. 81, July 1960, p. 64-66.

12411* Non-Linear Theory of a Wind-Driven Homogeneous Layer Near the Equator. Deals with the equatorial motion produced by a uniform east wind blowing over a homogeneous ocean of constant depth. Shows by a dimensional argument that for the range of parameters applicable to the Cromwell Current, the inertial forces are equally important with the frictional forces. The motion is calculated for several values of the coeffiicent of eddy-viscosity. ***Jule G. Charney.*** *Deep-Sea Research*, v. 6, no. 4, June 1960, p. 303-310.

12412* Micro-Organisms as Indicators of Hydrological Phenomena in Seas and Oceans. III. Distribution of Water Masses in the Central Part of the Pacific Ocean (According to Microbiological Data). A study of the vertical distribution in numbers of heterotrophs was carried out in the Pacific Ocean along two parallel sections. The equatorial-tropical zone is distinguished by a relative abundance of heterotrophs assimilating only easily accessible organic matter. The equatorial-tropical waters are found at various subsurface levels in the subtropical areas. In the equatorial zone, two layers of water, 373-550 m and 700-1800 m, were similar in their organic content to Arctic and Antarctic waters; these layers expanded considerably north and south from the equatorial zone. ***A. E. Kriss, S. S. Abyzov, and I. N. Mitzkevich.*** *Deep-Sea Research*, v. 6, no. 4, June 1960, p. 335-345.

12413* Slimhole: Technology's Answer to an Economic Need. Some advantages of slimhole drilling are: extended bit life, use of drill tubing or thin-wall drill pipe, improved hydraulics, wide range of fishing tools, perfection of completion techniques, and better well servicing equipment. ***Robert O. Frederick.*** *Drilling*, v. 21, Aug. 1960, p. 49-51.

12414 Electronics Probes Nature, Space, Our Atmosphere, the Earth, the Oceans, Living Matter. From the sensors carried in space vehicles and the techniques of radio and radar astronomy, man is gaining new insight into space. Meteorological satellites, sounding rockets, and weather radars are among the host of probes with which man is learning more about the atmosphere—his earliest scientific laboratory. In the study of the Earth, electronics is providing the geologist with powerful new tools. To study the 71% of earth covered by the seas, oceanographers will need not only improved but more reliable instrumentation. ***William E. Bushor and Michael F. Wolff, editors.*** *Electronics*, v. 33, no. 31, July 29, 1960, p. 53 + 27 pages + 1 plate.

12415* What Makes a Drought? There seems to be great evidence that hot, dry, rising air masses are the major cause of droughts. Discusses the sources of these air masses. ***Frank D. Steiner.*** *Engineering*, v. 190, July 8, 1960, p. 48-49.

12416* Monitoring Fluoride Content of Air, Water and Vegetation. ***Charles R. McHenry and Hoyt Charles.*** *Farm Chemicals*, v. 123, Aug. 1960, p. 58-62.

12417* The Nutrition-Circle in the Sea. The nutrition of fish takes place with the help of a "nutritive chain" and shows remarkable differences in its chemical composition, depending upon the type of food, location, and time. (*In German.*) Über den Nahrungskreislauf im Meer. ***H. Friedrich.*** *Fette, Seifen, Anstrichmittel*, v. 62, no. 6, June 1960, p. 517-522.

12418* Underground Gas Storage. ***H. L. Fruechtenicht.*** *Gas Age*, v. 126, July 21, 1960, p. 26-30.

12419 Electromagnetic Scattering by High-Density Meteor Trails. ***H. Brysk.*** *IRE Transactions on Antennas and Propagation*, v. AP-7, Special Suppl., Dec. 1959, p. S330-S336. (TK1 In6.6ap Vis.)

12420 Illinois Fluorspar. Describes the geology, production, economic aspects, and uses of Illinois fluorspar. Production comes for underground mines. Lead and zinc are important by-products. ***G. C. Finger, H. E. Risser, and J. C. Bradbury.*** *Illinois State Geological Survey, Circular* 296, 1960, 36 pp. (TN21 IL6.7c Vis.)

12421* Behavior of Pyrite During the Flotation of Coal Slurrings. Sulfur concentration is due to the low efficiency removal of grains containing pyrite from slurries and to the evident concentration of the S amount by the passage of a large quantity of pyrite-containing grains into the concentrate of the chambers of the second half of the machine. (*In Russian.*) Povedenie pirita pri flotatsii ugol'nykh shlamov. ***N. D. Ogloblin.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, Gornyĭ Zhurnal*, 1960, no. 6, p. 133-138.

12422* Polarization of Non-Thermal Radio Emission From the Galaxy and Radio Emission From the Crab Nebula. The depolarization of emission from the emitting clouds to the point of observation was taken into account. In the case of an isotropic model of emitting clouds and of clouds causing depolarization, the values of the degree of polarization are too low in comparison with the experimental values found in papers. (*In Russian.*) K voprosu o poliarizatsii neteplobogo radioizlucheniia galaktiki i radioizlucheniia krabovidnoĭ tumannosti. ***V. V. Pisareva.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, Radiofizika*, v. 3, no. 2, 1960, p. 165-179.

12423* Laboratory Studies of a Pulsed Neutron-Source Technique in Well Logging. Discusses a technique using a borehole accelerator as a neutron source, which gives an improved scintillation spectrum. The Schlumberger-accelerator neutron source is presented; the origins of inelastic and of thermal-neutron, capture γ rays are discussed, and results are given for some laboratory measurements performed in borehole geometry. ***J. Tittman and W. B. Nelligan.*** *Journal of Petroleum Technology*, v. 12, July 1960, p. 63-66.

12424* Applications of Nuclear Science in Petroleum Production. Reviews nuclear science in geochronology and well logging; discusses use of radioactive tracers in well completion, well testing and repairs; briefly mentions possible applications for utilizing energy released by nuclear explosions in petroleum production. ***Milton Williams.*** *Journal of Petroleum Technology*, v. 12, Aug. 1960, p. 11-13.

12425* On the Frost Contents of Soils During the Winter Frost Penetration. The freezing of cohesive soils is accompanied by an increase in the moisture contents in the frozen zone, water migrating into it from below. Ice segregations in the frost-susceptible soils make the soils bulge. In the thawed ground underlying the frozen layer, moisture content decreases, the least being in the zone of contact of the frozen and the thawed layers. (*In Russian.*) K voprosu o rezhime vlazhnosti gruntov pri simnem promerzanii. ***G. P. Mazurov.*** *Leningrad. Universitet. Vestnik*, v. 15, no. 12, 1960, p. 73-81.

12426* Preliminary Chemical and Spectrographical Analysis of a Mid-Adriatic Deep Sea Sample. Description of the initial results of the examination of a 579 meter-long core No. 4 picked up November 1, 1957, in latitude 43° 10′ N and longitude 15° 10′ E, at a depth of 218 m, near the center of the Adriatic deep. (*In Italian.*) Analisi chimica e spettrografica preliminare di un campione di fondo dell'Adriatico centrale. ***N. Chierego and D. Bregant.*** *Metallurgia Italiana*, v. 52, June 1960, p. 372-373.

12427 Water, a Controlling Factor of Copper Production. ***S. D. Michaelson, B. H. Ensign, S. J. Hubbard, and A. W. Last.*** *Mining Engineering*, v. 12, July 1960, p. 674-674D.

12428* Reversed Seismic Profiles Provide Better Rippability Factors. ***James W. Crosby, III.*** *Mining World*, v. 22, no. 9, Aug. 1960, p. 30-31.

12429 Oceanography of Long Island Sound. A survey of investigations. ***T. John Hart.*** *Nature*, v. 187, July 9, 1960, p. 123-124.

12430 Magnetization of Sediment Cores From the Eastern Atlantic Ocean. ***M. J. Keen.*** *Nature*, v. 187, July 16, 1960, p. 220-222.

12431* Effects of the Layout Profile of Pipe-Lines and of the Difference in the Specific Weights of Oil Products on the Degree of Their Mixture During Consecutive Transfer. The consecutive transfer of some petroleum products can be carried out only under fully developed turbulence conditions of the movement (Re $>$ 10000). For any pipeline under fully developed turbulent conditions of the movement in the case of low viscosity liquids, the mixing process depends on the conditions of the movement and on the geometric dimensions of the pipelines. (*In Russian.*) O vliianii profilia trassy truboprovodov i raznosti udel'nykh vesov nefteproduktov na stepen' ikh smesheniia pri posledovatel'noĭ perekachke. ***V. S. Iablonskiĭ, G. G. Kornilov, K. D. Frolov, and M. V. Nechval'.*** *Neftianoe Khoziaistvo*, v. 38, no. 6, June 1960, p. 55-61.

12432* Selection of a Storage Coefficient of Cement in Calculating the Cementation of a Well. The value of the storage coefficient adopted and the ratio of the diameters of the bore-bit and of the column must be linked togther. For each oil field, one must have the curves of the relationship between the coefficient and the area of the annular section. Tests must be conducted on a wide scale. Accurate selection guarantees safe insulation of seams and saves thousands of tons of cement. (*In Russian.*) O vybore koeffitsienta zapasa tsementa pri raschete tsementirovaniia skvazhin. ***K. I. Mangushev.*** *Neftianoe Khoziaistvo*, v. 38, no. 7, July 1960, p. 47-50.

12433* Measuring Geological Time. Based on radioactive decay. ***L. R. Wager and Stephen Moorbath.*** *New Scientist*, v. 8, July 14, 1960, p. 136-139.

12434* Some Meteorologically Important Relationships Between the Ocean and Atmosphere. ***G. Neumann.*** *New York Academy of Sciences, Transactions*, v. 22, no. 8, June 1960, p. 615-633.

12435 Oceanography 1960 to 1970. Discusses some of the present and future military applications of oceanographic information; advances in acoustic detection and surveillance systems, in means of using the oceans to monitor nuclear tests, in the accuracy and detail of world-wide daily, weekly, and monthly weather forecasts, in use of deep submarines and permanent observation stations to protect our nation against surprise attack, in arrays of automatic buoys and data analysis systems, and in a multitude of achievable applications now undreamed of. 15 pp. 1960. National Academy of Sciences, National Research Council, Washington, D. C. (GC3 N21.5o Over.)

12436 New Cement Additive Cuts Water Loss. ***Ed McGhee.*** *Oil and Gas Journal*, v. 58, no. 31, Aug. 1, 1960, p. 119-121.

12437 Watch Those Mixed Injection Waters. Plugging of pipe, formations, screens, and filters can result from the mixing of waters containing various elements. Repairing damage from precipitation can cost more than a water treatment. ***L. C. Case.*** *Oil and Gas Journal*, v. 58, no. 32, Aug. 8, 1960, p. 92-95.

12438 Continuous Seismic Profiler—A New Far North Exploration Tool. Seismic exploration in lakes and rivers involves a repeatable sound source towed behind a boat. Sound waves are picked up and transmitted to a compact recorder. ***A. E. Pallister.*** *Oil and Gas Journal*, v. 58, no. 33, Aug. 15, 1960, p. 132 + 1 page.

12439 Foam Removes Brine From Deep Texas Wells. Foam method of liquid removal from gas wells was tested in two high-temperature wells in West Texas. Ellenburger lime production was stimulated at a depth of 15,000 ft., where bottom-hole temperatures reached 208 F. ***J. L. Eakin, A. D. Hopkins, and H. N. Dunning.*** *Oil and Gas Journal*, v. 58, no. 33, Aug. 15, 1960, p. 162-163.

12440 The Other Side of the Moon. Covers the design, orbit, photography, and image transmission of the automatic interplanetary station. 36 pp. 1960. Pergamon Press, New York. (QB595 Ak13ptr)

12441 Exploration Drilling. Presents Mining Engineering Series, Proceedings of the Ninth Annual Drilling Symposium, October 8-10, 1959. ***Howard L. Hartman, editor.*** *Pennsylvania State University, Mineral Industries Experiment Station, Bulletin No.* 72, Mar. 1960, 126 pp. (TN21 P38b Vis.)

12442 Observations on Extensive Air Showers. VIII. The Distribution in Declination and Curvature of the Shower Front. A directional Čerenkov counter was used at latitude 52 N to separate shower directions into two classes, incident from North and South of the East-West plane through the zenith. A reported Northern excess of approximately 30% was not observed. ***E. F. Bradley and N. A. Porter.*** *Philosophical Magazine*, v. 5, ser. 8, Apr. 1960, p. 305-310.

12443 Cosmic-Ray Production Rates of Be^7 in Oxygen, and P^{32}, P^{33}, S^{35} in Argon at Mountain Altitudes. The production rates of the above were measured by exposing Ar and water to cosmic rays at mountain altitudes for periods of two to four months during 1959. Isotope production rates for all regions in the atmosphere were calculated by Lal, *et al.* The measured production rates are higher than the calculated rates. ***Devendra Lal, James R. Arnold, and Masatake Honda.*** *Physical Review*, v. 118, 2nd ser., no. 6, June 15, 1960, p. 1626-1632.

12444* Are Your Screens Really Efficient? Describes a way to check separation equipment to meet the coming challenges for precise gradation. ***Karl Hauser.*** *Rock Products*, v. 63, Aug. 1960, p. 120 + 3 pages.

12445 Evaluation of Average Crustal Characteristics From Reverberation of Sesimic Waves. ***J. N. Nanda.*** *Royal Society, Proceedings*, v. 256, ser. A, May 31, 1960, p. 28-38.

12446 First Natural Occurrence of Coesite. The high-pressure polymorph of SiO_2, hitherto known only as a synthetic compound, is identified as an abundant mineral in sheared Coconino sandstone at Meteor Crater, Arizona. ***E. C. T. Chao, E. M. Shoemaker, and B. M. Madsen.*** *Science*, v. 132, July 22, 1960, p. 220-222.

12447 Geodetic Uses of Artificial Satellites. Discusses the coordinate systems, observations to objects of known positions, observations of orbiting objects, applications of methods, and the use of the Moon. ***George Veis.*** *Smithsonian Contribtuions to Astrophysics*, v. 3, no. 9, 1960, p. 95-161.

12448* The Use of Gas Logging in Prospecting. The most important elements in the hydrocarbon characteristics of gas logging are: depth of the first appearance of hydrocarbons in the well bore, magnitude of the concentration gradient, and shape of the hydrocarbon curve. Quantitative changes can be noted between the gas logging data of areas with the more permeable rocks of Tertiary and Cretaceous age and areas composed of more dense and less permeable strata of Paleozoic age. (*In Russian.*) Primenenie gazovogo karotazha v poiskovykh tseliakh. ***G. A. Mogilevsky.*** *Sovetskaia Geologiia*, v. 3, no. 6, June 1960, p. 119-128.

12449* Breakwaters. Norwegian Practice and Experience Compared With Theory and Research. During the past 75 years, some 350 breakwaters of all sizes and with varying exposure, were built along the Norwegian coast. These structures have stood up well, a fact which agrees poorly with widely accepted formulas. Norwegian experience gives some indication that the influence of the wave height on the required armor weight may be less than indicated by all current formulas. (*In Norwegian.*) Rausmoloer. Norsk praksis og erfaring sammenholdt med teori og forsøk. ***Anton Brandtzoeg.*** *Teknisk Ukeblad*, v. 107, no. 27, July 7, 1960, p. 578-591.

12450 Surface Motion From an Underground Detonation. Surface and near-surface acceleration and strain were measured on a deep underground nuclear burst (Rainier Shot; 900 feet; 1.7 kt) to permit extrapolation of results to nuclear detonations of other yields under different test or employment conditions. Results indicate that large earth cap, probably including more than one chunk, separated from the mesa over the charge and fell back into place. The only significant vertical displacement occurred at, or near, ground zero and reached a maximum of approximately 0.9 feet. ***L. M. Swift and D. C. Sachs.*** *U. S. Atomic Energy Commission*, WT-1528, Apr. 1, 1959, 82 pp. (UF767 Un3.1wt Contin.)

12451* Measured Electrical Properties of Snow and Glacial Ice. The electrical properties of snow and glacial ice near 0 C were observed over the frequency range from 20 cycles per sec to 200 kc per sec. The conductivity of snow and glacial ice is found to be much higher than that for pure ice. This is particularly so at frequencies below 2 kc per sec. ***A. D. Watt and E. L. Maxwell.*** *U. S. National Bureau of Standards, Journal of Research, Section D, Radio Propagation*, v. 64D, no. 4, July-Aug. 1960, p. 357-363.

12452* Current Oil Industry Fishing Techniques and Tools. I. Cased Hole. Recovering a fish may vary from one operator to another. Presents proven techniques currently accepted by industry. ***Weldon Medders and D. U. Skinner.*** *World Oil*, v. 151, Aug. 1960, p. 47-72.

See also: **12051** (water).

GRAPHIC ARTS

12453* Printing Surfaces of Paper. With the increase in the variety of printed products, types of presses and printing conditions, the problem of supplying the right kind of paper for each process and end use is an extremely complicated one. ***Walter W. Roehr.*** *American Pressman*, v. 70, no. 7, July 1960, p. 17 + 3 pages.

12454* Printing on Polyethylene. Discusses six commonly accepted methods of printing polyethylene and describes several adaptations and modifications. Not all of these methods are presently used commercially on polyethylene. They are included as potential methods for printing or decorating. *American Pressman*, v. 70, no. 7, July 1960, p. 33-36.

12455 How to Stop Bending Spacebands. Discusses restoration of temper in spacebands, re-establishment of clutch spring pressure, check adjustment of the driving clutch, wear on reference side of mats. ***Leroy Brewington.*** *Canadian Printer and Publisher*, v. 69, July 1960, p. 133-137.

12456* Flexographic Printing Tests. VII. Ink Film Property Tests. *Flexography*, v. 5, no. 8, Aug. 1960, p. 18-20.

12457 The Calculated Miss. The judgment of the operator in calculating proper exposure and development time is the crucial factor in graphic arts photography; here is a shop-tested calculating technique. ***Joseph P. Halbherr.*** *Gravure*, v. 6, Aug. 1960, p. 22 + 6 pages.

12458* Photoinstrumentation Gets the Proof at General Motor's Proving Ground. *ISA Journal*, v. 7, Aug. 1960, p. 48-51.

12459* What Improvements Are Needed on Today's Web Offset Presses? An attempt to control web slippage was made by placing two large rollers between each pair of units and wrapping web part way around each unit. ***Charles W. Latham.*** *Inland and American Printer and Lithographer*, v. 145, no. 4, July 1960, p. 66 + 3 pages.

12460* Researcher Points Out Wrap-Around Plate Trends. Major developments are in direct relief, not planographic, plates. Depth of etch is a major factor in direct printing from flexible surfaces. Predicts widespread commercial use of shallow-etched wrap-around plates. ***John W. Rockefeller, Jr.*** *Inland and American Printer and Lithographer*, v. 145, no. 4, July 1960, p. 84-85.

12461* How to Make Deep-Etch Aluminum Offset Plates. They are more expensive to make than presensitized or wipe-on plates because of extra steps involved, but are a good choice when long runs are necessary. ***Charles W. Latham.*** *Inland and American Printer and Lithographer*, v. 145, no. 5, Aug. 1960, p. 58.

12462 Ultra-High-Speed Photographs Refuting "Cohesion in Plasma". A sequence of framing camera pictures was presented, and the sequence was interpreted as evidence that, as the result of the detonation of a quantity of explosive, a plasma was ejected into the atmosphere, and that the plasma exhibited a strong cohesive force. Presents pictures of an essentially identical subject, taken at three exposure times. They show that the phenomena are those of a shock wave, and that no new assumption of cohesive force is necessary to interpret the pictures. ***W. C. Davis and A. W. Campbell.*** *Journal of Applied Physics*, v. 31, July 1960, p. 1225-1227.

12463* An Electronic Tone Masking Printer for the Duplication of 35mm Colour Transparencies. Discusses characteristics of Ilford color as they affect the problem of duplication. Establishes the need for a negative contrast mask and derives its ideal characteristic. Describes an electronic method capable of producing instantaneously a mask of the requisite nature. This is done by modulating the television-type raster on a cathode ray tube acting as the light source for a contact printer. ***D. M. Neale and D. S. Reid.*** *Journal of Photographic Science*, v. 8, no. 3, May-June 1960, p. 85-101.

12464* A Machine for High Speed Printing From 35mm Colour Transparencies A machine for making color prints at high speed from 35 mm transparencies employs one operator to load transparencies into a storage magazine, from which they are fed into the machine automatically and after printing are unloaded by a second operator. Color quality of the light is controlled by varying the phase relationship between synchronously rotating sectored filter discs. ***J. H. Coote and A. P. Jenkins.*** *Journal of Photographic Science*, v. 8, no. 3, May-June 1960, p. 102-105.

12465* The Chemical Nature of Restrainers. Hide gelatins were examined by a method in which they are hydrolysed, the restraining substances precipitated with silver nitrate and, after extraction, examined by paper chromatography. Shows the position of the spots in short U.V. light. Restraining substances contain purine groups and are nucleic acid fragments, not the nucleotides. ***P. S. Gordon and E. D. Swann.*** *Journal of Photographic Science*, v. 8, no. 3, May-June 1960, p. 105-112.

12466* The Estimation of Adenine in Gelatin With Reference to Restraining Properties. A colorimetric method is given for the estimation of adenine, a nucleic acid component, in gelatin. Hide gelatins are found to contain more adenine than bone gelatins, and the amounts present is sufficient to account for restraining properties in the former. ***H. W. Wood.*** *Journal of Photographic Science*, v. 8, no. 3, May-June 1960, p. 113-118.

12467* The Chemical Sensitization of Silver-Iodide Emulsions. Shows the sensitivity of silver-iodide emulsions to be dependent upon the silver-complexes present at the surface of the grains. These complexes increase the useful absorption of light as well as increasing halogen acceptance in the system. ***E. A. Sutherns.*** *Journal of Photographic Science*, v. 8, no. 3, May-June 1960, p. 118-123.

12468* Chemistry and Colour Photography. Discusses the use of yellow, magenta, and blue-green dyes, developers, and couplers. *Manufacturing Chemist*, v. 31, July 1960, p. 301.

12469* Aerial Photography To-Day. The value of aerial photography in the last war needs no other proof than that those who used it best, won. Today its importance is often overlooked. Yet the postwar years were full of unsung but significant improvement. ***Allan L. Sorem.*** *Perspective*, v. 2, no. 2, 1960, p. 120-148.

12470* Printing by Electronics. Post-war technology is tied to the ubiquitous electron: there are few fields in which its versatile power is not felt. Now that same power was harnessed to the prosaic task of photographic printing, with results that exceed the capabilities of conventional methods. ***L. A. Mannheim.*** *Perspective*, v. 2, no. 2, 1960, p. 149-158.

12471* Progress in Reproduction Techniques. For a long time, change in reproduction method for printing was slow. But in the 20th century, progress in the applications of photography has marched in step with a revolution in printing; no longer can one ignore the other. ***J. J. Butler.*** *Perspective*, v. 2, no. 2, 1960, p. 159-166.

12472* Electrothermography—A New Electrostatic Printing Technique. A process by which electrostatic prints can be obtained by heat dissipation of an applied charge. The method is based on a spontaneous discharge of a critical temperature. A tentative explanation of the phenomena involved is offered and

is supported by resistivity, enthalpy, and breakdown measurements. ***P. M. Cassiers.*** *Photographic Science and Engineering*, v. 4, no. 4, July-Aug. 1960, p. 199-202.

12473* Measuring and Judging Photographic Exposure of Color Film for Automatic Exposure Controlled Cameras. The accuracy of an automatic camera in measuring photometric exposure is closely controlled in manufacture by precise and reproducible methods. The photographer may decide his exposure preference by comparing several photographs which differ only in exposure. The difference between the predetermined exposure and the preferred-picture is the discrimination accuracy of the meter. While the discrimination error is not apparent for most scenes, it may be as much as one exposure value unit for some unusual scenes. Explains methods of measuring the different types of exposure accuracy and defines the terms. ***Allen Stimson.*** *Photographic Science and Engineering*, v. 4, no. 4, July-Aug. 1960, p. 203-207.

12474* Magnesium, A New Light Source in Flashlamps for Sequence and High-Speed Motion Pictures. The use of Mg, Al, and Zr as light sources follows logically from thermodynamic and kinetic considerations. Gives new use of Mg for long-duration flashlamps in sequence and high-speed motion-picture photography. ***W. C. Fink.*** *Photographic Science and Engineering*, v. 4, no. 4, July-Aug. 1960, p. 208-212.

12475 High-Speed Photography Solves Design Problems. Ordinary movies record a sequence of events. But high-speed pictures are a better tool for analysis—they stretch out the important split seconds. They solve many design and development problems faster and cheaper than by analytical or mathematical methods. ***Frank E. Hall.*** *Product Engineering*, v. 31, no. 34, Aug. 22, 1960, p. 29-36.

See also: **12169** (ink manufacture).

HEAT POWER

12476 The Saturn Project. Brief history of project; objectives of the program; net weight capabilities. ***William A. Mrazek.*** *Astronautics*, v. 5, July 1960, p. 26 + 3 pages.

12477 Complex Problems Are Solved in Small Gas Turbine Manufacturing. ***Jack Lewis.*** *Automotive Industries*, v. 123, no. 2, July 15, 1960, p. 76 + 3 pages.

12478* The Capacity of Reaction of Coke. A Method for Its Determination and Its Dependence on the Conditions of Preparation of Coke. At a constant temperature, coke is allowed to react with CO_2 introduced into the test tube at a constant flow velocity. From the speed of formation of CO, the defined speed constant is determined as the capacity of reaction. The differences in the reactivity of different cokes and the variations of the reactivity during consumption are given as examples. (*In German.*) Über die Reaktionsfähigkeit von Koks. Eine Methode zu ihrer Bestimmung sowie ihre Abhängigkeit von den Herstellungsbedingungen des Kokses. ***Kurt Hedden.*** *Brennstoff-Chemie*, v. 41, no. 7, July 1960, p. 193-203.

12479* Experiments With High-Temperature Fuel Cells. Presents investigation results of high-temperature fuel cells. The cells were operated principally with CO at temperatures of 600-800 C, and a so-called semisolid electrolyte, consisting of a 3-5 porous MgO disk. (*In German.*) Versuche mit Hochtemperatur-Brennstoffzellen ***K.-H. Krieb.*** *Brennstoff-Wärme-Kraft*, v. 12, July 1960, p. 321.

12480* Brown Boveri Gas Turbines for an Inlet Temperature of 750°C. Describes gas-turbine installations which are now in service, and discusses the operational experience gained with them. ***H. Pfenninger.*** *Brown Boveri Review*, v. 47, no. 1-2, Jan.-Feb. 1960, p. 35-64.

12481 Foreign Fuel Cell Advances Spur Electricity-From-Chemicals Race. *Chemical Week*, v. 87, no. 5, July 30, 1960, p. 28 + 3 pages.

12482* Solar Water Heaters for Domestic Purposes. *Copper*, no. 9, Summer 1960, p. 9-11.

12483 Fuel Cell Power Pack Developed for Military Use. Weighs 30 lb. and delivers 200 w. at 24 v. *Electrical Engineering*, v. 79, Aug. 1960, p. 699-700.

12484 Wind-Energy Convertors Provide High Power. May be able to produce several million v. at one amp. ***M. C. Gourdine.*** *Electronics*, v. 33, no. 33, Aug. 12, 1960, p. 148 + 1 page.

12485* Ducted Fans Show Promise for VTOL. Recent advances in gas turbine technology have lead to the design of engines with high thrust-to-weight ratios. These may make vertical take-off by jet lift a practical possibility. *Engineering*, v. 190, July 15, 1960, p. 102-103.

12486* The Potential in the Free-Piston Engine Principle. Points out the not yet utilized potential in the free-piston engine principle and compares it with the potential remaining for further development or advancement possible with the conventional engine principles of today. ***A. Braun.*** *Engineering Journal*, v. 43, July 1960, p. 57-61.

12487* Propulsion—Methods and Applications. Surveys methods and applications used at present and visualized for the future. *Engineering Materials and Design*, v. 3, Aug. 1960, p. 473-480.

12488* Operating Experience With High-Pressure Francis Spiral Turbines. ***G. Gysi.*** *Escher Wyss News*, v. 32, nos. 2-3, 1959, p. 14-28.

12489* The Turbo-Furnace. Describes ability of the design to handle a wide variety of fuels without significant change in the performance of the furnace or superheater, and the implications of this feature. ***J. D. Williams.*** *Institute of Fuel, Journal*, v. 33, July 1960, p. 328-336 + 2 plates.

12490* The Combustion Process in Swirl Chamber Type Diesel Engines. The formation of an over-rich mixture in the peripheral zone brings about two favorable factors for a rapid and complete combustion; one is the possibility of an earlier outflow of the mixture into the main chamber, and the other is the most effective use of thermal mixing effect in the swirl chamber. ***Fujio Nagao and Harutoshi Kakimoto.*** *Kyoto University. Memoirs of the Faculty of Engineering*, v. 22, pt. 2, Apr. 1960, p. 176-196.

12491 Stress on Fuel Cells, Solar Systems. Electrical power research aims for lighter, more reliable solar and chemical sources. *Missiles and Rockets*, v. 7, no. 6, Aug. 8, 1960, p. 31.

12492 Combustion and Propulsion. High Mach Number Air-Breathing Engines. ***W. Cawood.*** *Nature*, v. 187, July 2, 1960, p. 18-21.

12493* Electrochemical Energy Production by Means of Indirect Fuel Elements. Surveys properties of fuel elements, such as standard original potentials and ideal efficiency values of gas reactions, the catalytic activity of the electrodes for H_2 and O_2, the Allis Chalmers Mfg. Co. tractor with C_3H_8/O_2 element, indirect elements for liquid fuels, elements with equilibrium electrolytes, and the different uses of gas electrodes. (*In German.*) Elektrochemische Energieerzeugung durch indirekte Brennstoffelemente. ***E. Justi and A. Winsel.*** *Naturwissenschaften*, v. 47, no. 13, July 1960, p. 289-300.

12494* Modern Turbochargers. The first model of a new series of turbochargers, the B-115, is applicable to both two- and four-stroke engines. The turbocharger is described. *Oil Engine and Gas Turbine*, v. 28, July 1960, p. 82-83.

12495 Propellant Vaporization as a Criterion for Rocket-Engine Design: Experimental Effect of Combustor Length, Throat Diameter, Injection Velocity, and Pressure on Rocket Combustor Efficiency. The efficiency of a heptane-oxygen rocket combustor was measured. Results show that efficiency increases with injection velocity, pressure, combustor length, and contraction ratio. ***Bruce J. Clark.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-258, Apr. 1960, 27 pp. (TL570 Un3t Room 290)

12496 Satellite and Space Propulsion Systems. Solar turbo-electric systems can be used only at altitudes above about 300 miles. The nuclear turboelectric system without shielding is competitive in this range of power, but shielding requirements,

particularly for manned vehicles, may rule it out. Chemical batteries are competitive weightwise only for a few days. For periods of operation of 100 to 200 days or less, a chemical rocket can provide the required propulsive energy without excessive weight penalty relative to electric systems. ***Wolfgang E. Moeckel, et al.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN-D-285,* June 1960, 47 pp. (TL570 Un3t Room 290)

12497* Determination of Rate of Heat Transfer Between the Gases and the Cylinder Walls of a Spark-Ignition Engine. *Tatsu Oguri.* *Yokohama National University, Faculty of Engineering, Bulletin,* v. 9, Mar. 1960, p. 1-29.

See also: **12010** (energy for water); **12721** (gamma-ray rocket motor inspection).

INFORMATION—PREPARATION AND DISSEMINATION

12498* On Relevance, Probabilistic Indexing and Information Retrieval. Reports on a novel technique for literature indexing and searching in a mechanized library system. The notion of relevance is taken as the key concept in the theory of information retrieval and a comparative concept of relevance is explicated in terms of the theory of probability. The resulting technique called "Probabilistic Indexing", allows a computing machine, given a request for information, to make a statistical inference and derive a number for each document, which is a measure of the probability that the document will satisfy the given request. Suggests an interpretation of the whole library problem as one where the request is considered as a clue on the basis of which the library system makes a concatenated statistical inference in order to provide as an output an ordered list of those documents which most probably satisfy the information needs of the user. ***M. E. Maron and J. L. Kuhns.*** *Association for Computing Machinery, Journal,* v. 7, no. 3, July 1960, p. 216-244.

12499 Research in Documentation. Compilation of papers from symposium on documentation, given at Conference on Scientific Communication, as part of AAAS Annual Meeting, Dec. 29, 1959. ***Joseph Gray Jackson, Julius Frome, Marjorie R. Hyslop, D. D. Andrews, and Allen Kent.*** *Franklin Institute, Journal,* v. 270, no. 1, July 1960, p. 1-50.

12500* Lack of Indexes in Reports of Conferences. About half of the reports investigated lacked indexes. This situation causes great inconvenience to scientific and technical readers. ***C. W. Hanson and Marian Janes.*** *Journal of Documentation,* v. 16, no. 2, June 1960, p. 65-70.

12501* Presentation of the Results of an Industrial Engineering Study. An industrial engineer should develop the customer's confidence in his ability to make a good product, use terms that the customer can easily understand and accept, and permit the customer the dignity of making his own decisions. ***Ralph J. Beuter.*** *Journal of Industrial Engineering,* v. 11, no. 4, July-Aug. 1960, p. 287-289.

12502* Soviet Library Literature: A Survey of Selected Manuals of Methodology. There is the planned and organized process of solving problems along vertical lines. This is the area approach, or the delegated authority down to republican, regional, and district libraries. There is research and organization along horizontal lines; this is the subject approach, or delegated authority among the general, humanities, and science libraries. ***Elizabeth Beyerly.*** *Library Quarterly,* v. 30, no. 3, July 1960, p. 173-187.

12503* Some American Twentieth Century Book Catalogs: Their Purposes, Format and Production Techniques. Recent library book catalogs have been produced by the following methods: typing pages from card file for photo offset; tabulating cards machine-printed on multilith masters; tabulating cards machine-printed as final copy; tabulating cards machine-printed to make copy for offset reduction; tabulating cards printed by sequential camera; microfilming of 3x5 in. cards with electrostatic printing. These methods have provided valuable bibliographic tools at reasonable costs. ***Richard H. Shoemaker.*** *Library Resources and Technical Services,* v. 4, no. 3, Summer 1960, p. 195-207.

12504* A Manual on the Use of the Dewey Decimal Classification. Describes the manual and discusses a suggested table of contents, examples of typical entries, and editorial procedure. ***Benjamin A. Custer.*** *Library Resources and Technical Services,* v. 4, no. 3, Summer 1960, p. 247-252.

12505 Preparing a Design Handbook. Discusses what the book should contain, organizing for handbook preparation, production methods and problems, distribution of the handbook. ***R. W. Beckim.*** *Machine Design,* v. 32, Aug. 4, 1960, p. 104-108.

12506* Handling Paperwork. Consists of three articles on electronics mail handling, conveyors "reading" book orders, and a paperwork conveyor system. *Material Handling Engineering,* v. 15, no. 11, Aug. 1960, p. 55-59.

12507 How to Write Standard Operating Procedures. Written instructions are essential to any large organization. They ensure that all those repetitive tasks—from preparing reports to ordering paper clips—will be done with minimum time and effort. Here are some tips on when to use them, how to prepare them, and how to get them approved. ***D. P. Simonton.*** *Product Engineering,* v. 31, no. 31, Aug. 1, 1960, p. 46-47.

12508* Preparation of Ordnance Publications for Guided Missile Systems. The Ordnance Corps is developing automatic universal test equipment which can be used to fault-isolate any missile system and which ultilizes digital and analog computers for decision-making, rather than depending upon a human decision inspired by printed instructions. ***Frank E. Napper.*** *STWP Review,* v. 7, no. 3, July 1960, p. 4-7.

12509* The Publications Department's Role in Proposal Preparation. Discusses organization and preparation, printing coordination, and content planning. ***William Luke Moore.*** *STWP Review,* v. 7, no. 3, July 1960, p. 8-10.

12510* Scientific Abstracting and Indexing Services. Discusses: past developments—types of abstracting and indexing services and the growth of these services; current developments—shows published abstracts and periodicals abstracted by Chemical Abstracts; future developments—points out that it is desirable to cooperate on an international basis. UNESCO is already active in this field. ***Randall G. Rice, Charles L. Bernier, and Dale B. Baker.*** *STWP Review,* v. 7, no. 3, July 1960 p. 11-15.

12511* The Use of Data Processing Equipment for the Control and Circulation of Magazines. A method of circulation of magazines to interested personnel of the Locomotive & Car Equipment Department of General Electric Company, Erie, Pennsylvania, is described. ***Ronald J. Booser.*** *Special Libraries,* v. 51, no. 6, July-Aug. 1960, p. 297-300.

See also: **12002** (selected abstracts on mechanical behavior of ceramics).

INSTRUMENTATION

12512 Dynamics of a Gyroscope With Two Degrees of Freedom. Gyroscopes with two degrees of freedom are used to measure the absolute angular velocity of various bodies. The static theory of a two-degree gyroscope starts with the assumption that at each instant of time the deviation of the gimbal from its reference position in the body is determined by its relative equilibrium under the action of the gyroscopic moment and the moment of the restoring force. This assumption is admissible to a certain extent. However, when controlling unsteady angular motions of an object, or in the case of large disturbances, an estimate of the angular velocity of the object based on static theory may lead to noticeable errors and to the occurrence of false signals. ***M. Z. Litvin-Sedoy.*** *ARS Journal,* v. 30, July 1960, p. 691-695.

12513 Surface Area Determination of Magnesium Powders by Sorption of C-14-Labeled Oleic Acid. The chemisorption of oleic acid on Mg particles was used to determine the surface area of the grains when this area is only a few hundred sq cm/g. A simplified technique is suggested for routine measurement of several samples a day. ***C. M. Lapointe.*** *Canada, Mines Branch, Research Report,* R-60, Mar. 7, 1960, 10 pp. (TN26 C16.5r Contin.)

12514* An Automatic Recorder for a Calorimeter. With the help of an accessory instrument adapted to the commercial combustion calorimeter, easier calorimetric measurements and, especially, more systematic series measurements are possible. The test is automatically controlled by the instrument, which, in addition, gives an objective recording of the temperature change in the calorimeter, so that the readings obtained can be checked. The accuracy obtained with the recording attachment is as high at least as that resulting from the usual method for calorimetric measurements with the Beckmann thermometer. (*In German.*) Automatisches Registriergerät für ein Kalorimeter. ***G. Kästner.*** *Chemiker-Zeitung/Chemische Apparatur,* v. 84, no. 15, Aug. 5, 1960, p. 497-499.

12515* Automatic Exposure Controller for the Aurora Spectrograph. Relates to the automatic exposure control apparatus of the spectrograph especially designed for the observation of the aurora on the occasion of the International Geophysical Year. This spectrograph chiefly aims at the statistical observation of the change in the intensity of every spectral line of the aurora by photographing the spectrogram with a large aperture camera. ***Hideyuki Yashima, Shigeru Ando, and Yuzo Muranishi.*** *Mitsubishi Denki Laboratory Reports,* v. 1, no. 2, Apr. 1960, p. 29-42.

12516* Acceleration and Deceleration Control Using Magnetic Amplifiers. Developed a new system in which acceleration and deceleration of electric motors are directly controlled. The first aim is to obtain constant acceleration and deceleration characteristics under various conditions, and the second aim is to provide the above characteristics to give passengers the most comfortable condition. An actual system using magnetic amplifiers was constructed to control electric cars, and the test was over with successful results. ***Fumio Hamaoka and Eiichi Ohno.*** *Mitsubishi Denki Laboratory Reports,* v. 1, no. 3, July 1960, p. 1-10.

12517 Hard Gallium Alloys for Use as Low Contact Resistance Electrodes and for Bonding Thermocouples Into Samples. Describes a new family of low-contact resistance electrodes. These are hard alloys of gallium, prepared at room temperature in a manner similar to that of dental amalgams. They may be packed into cavities in semiconductors. The maximum operating temperatures range from 250 to 900 C for various alloys. The electrical characteristics, when used on ferrites and controlled valency semiconductors, are similar to those of the frequently used semiliquid In-Hg and In-Ga electrodes. ***George G. Harman.*** *Review of Scientific Instruments,* v. 31, July 1960, p. 717-720.

See also: **12055** (linear output flow meter).

LUBRICATION AND FRICTION

12518* Spur Gears—Hertzian Contact Times. The definition of contact time is based on the half-width of a band of contact. Of special interest are: first point of contact, first point where a single pair of teeth take all the load, pitch point, point where more than one pair again share the load, and the last point of contact. Expressions are developed for contact ratio, Hertzian contact stress, and Hertzian contact time for all five phases of contact. These relations apply directly to gear teeth with involute profiles, without consideration for deformation due to lubricant action. ***E. K. Gatcombe, R. P. Hunnicutt, and G. F. Kinney.*** *Lubrication Engineering,* v. 16, July 1960, p. 308-311.

12519* A New Approach to the Lubricating Problems of Internal Combustion Engines. Considers the isolated physical and chemical phenomena occurring; emphasizes the interconnections of laws and factors involved. The proposed scheme is illustrated by applying it to the compression ignition engine. ***F. A. Kirigin.*** *Lubrication Engineering,* v. 16, July 1960, p. 315-320.

12520* Review of Research Studies Showing Need for a Viscosity Test Below 1 Sec. ***E. L. Armstrong.*** *NLGI Spokesman,* v. 24, no. 5, Aug. 1960, p. 173-176.

12521* New Thickener System Extends Range of Multipurpose Greases. A new Ca complex was developed as a thickener for multipurpose grease having a greatly extended range of applications; prepared from calcium acetate and calcium salts of higher molecular weight acids. ***J. J. Kolfenbach and A. J. Morway.*** *NLGI Spokesman,* v. 24, no. 5, Aug. 1960, p. 180-185.

12522 New Concepts and Charts Simplify Journal-Bearing Design. Although there is still no precise method for designing a simple journal bearing, this study combines theory with test results to produce a new procedure and design chart that gives greater accuracy than methods now in use. ***G. S. A. Shawki.*** *Product Engineering,* v. 31, no. 31, Aug. 1, 1960, p. 31-36.

12523 On the Attainment of Fully Developed Flow in Lubrication Films. Problem of the development of flow in lubrication films is analyzed numerically. Development length is calculated and its effect on the pressure distribution determined. Owing to the thinness of lubrication films the error in load capacity introduced by the customary neglect of development effects is generally negligible. ***J. R. Bodoia and J. F. Osterle.*** *Wear,* v. 3, no. 3, May-June 1960, p. 165-169.

12524 Contact Area of Rough Surfaces. Gives analysis of the contacting process of surfaces that are rough and wavy; uses three contact areas: apparent, contour and real. A unit protrusion is modeled as a cone with a spherical top deformed elastically and plastically. It is assumed that elastic deformation of the spherical protrusion top takes place first; this is then flattened, allowing plastic deformation of the truncated cone. On the basis of this model, a formula is deduced to calculate real contact area as a function of load, geometry of the surface, and properties of the material. ***I. V. Kragelsky and N. B. Demkin.*** *Wear,* v. 3, no. 3, May-June 1960, p. 170-187.

12525 The Effect of Synthetic Additives in Lubricating Oil on Wear Under Friction. High molecular fatty esters, organo-chloro and organo-sulphur compounds, phosphites, thiophosphites and thiophosphates, and chloroalkyphosphonates were investigated. The action of Cl, S, and P atoms on the antiwear property of various compounds was determined. ***P. I. Sanin, E. S. Shepeleva, A. V. Ulyanova, and B. V. Kleimenov.*** *Wear,* v. 3, no. 3, May-June 1960, p. 200-218.

12526 A Replica Method for Examining Wear and Scuffing in Cylinder Liners. For the purpose of periodic inspection of cylinder liners during an engine test, a nondestructive method of examination had to be devised. Previous experience with replica methods indicated that plastic replicas could be used for the proposed examination of cylinder liners. Describes details of preparation and examination of the replicas of cylinder liners. It is apparent from the micrographs that replicas can be used to follow the progress of wear in cylinder liners or in other bearing surfaces which can be rendered accessible to replication. Gold evaporation on the surface enhances the contrast for photomicrography and was helpful for locating the same areas in successive steps. For many purposes, the replicas can be examined by vertical illumination without metal shadowing. ***A. P. Young and C. M. Schwartz.*** *Wear,* v. 3, no. 3, May-June 1960, p. 235-240.

See also: **12179** (solid lubricating coatings); **12409** (diamond drilling bit lubricant).

MECHANICAL ENGINEERING

12527* Problem of the Equilibrium of a Shallow Spherical Shell. The solution of the problem for an arbitrary transverse is applied for the derivation of the quotient solution for

axisymmetric loading of the spherical segment and a shallow shell of elliptical contour. (*In Ukrainian.*) Do zadachi rivnobagi pologoyi sferychnoyi obolonky. ***G. A. Van Fo Fi.*** *Akademiia Nauk Ukraïns'koi RSR, Dopovidi,* 1960, no. 5, p. 613-619.

12528* Thermal Stresses in Hollow Cylinders of Finite Length. A method of analysis is developed for determining the elastic stresses in a thick-walled hollow cylinder of finite length subjected to an axially symmetric temperature distribution. The general theorem of stationary strain energy is employed, together with an approximate specification of possible stress distributions. Numerical results are presented for the particular case of a cylinder of fixed geometrical proportions with a linear radial temperature distribution. ***C. J. Bellamy.*** *Australian Journal of Applied Science,* v. 2, no. 2, June 1960, p. 217-232.

12529* Non-Linear Bending of a Cantilever Under Several Concentrated Loads. The analysis of beams with "large" deflections rests with the solution of non-linear second-order differential equations. It is not always necessary to set up this type of differential equation for the solution of more complex cases, since the analysis can be traced back to the well-known results of the basic case, that is, a vertical strut carrying a vertical concentrated force at the top. ***R. Frisch-Fay.*** *Australian Journal of Applied Science,* v. 2, no. 2, June 1960, p. 233-243.

12530 Classical Dynamics. Discusses historical foundations, theory of vectors, kinematics of particle motion, kinetics of particle motion, systems of many particles, motion of a rigid body in a plane, motion of a system under impulses, the Lagrange equations for a general system, further properties of the inertia tensor, gyroscopic and non-holonomic problems, and small oscillations. ***R. H. Atkin.*** 273 pp. 1959. John Wiley & Sons, New York. (QA845 At51c)

12531* Multi-Circuit Hydraulics. Describes ground test stand equipment designed to test hydraulic systems of present-day aircraft; indicates components and capacities. ***John Murvin.*** *GSE; Ground Support Equipment,* v. 2, no. 3, June-July 1960, p. 52 + 1 page.

12532* Friction Forces in Wire Ropes. Considering wires wound along a spiral line as flexible elastic elements greatly simplifies the solutions of problems connected with the friction of the wires and of the strands in the rope; this theory agrees with experimental data. Problems concerning the effect of the wire section on the solidity of the rope, hysteresis, residual deformations, and metal wear in the ropes become practically solvable. (*In Russian.*) O silakh treniia v provolochnykh kanatakh. ***K. A. Mosiichuk.*** *Izvestiia Vysshikh Uchebnykh Zavedeniĭ, Gornyĭ Zhurnal,* 1960, no. 5, p. 87-92.

12533 Electromagnetic Disc Clutches. Discusses selection of criteria as influenced by load, torgue, heating, cycling, and controllability. ***Robert L. Kotnik.*** *Machine Design,* v. 32, Aug. 4, 1960, p. 113-122.

12534 Vibration Isolation Design. New way to find the forces in the components of a conventional system. ***Dennis P. Hanley.*** *Machine Design,* v. 32, Aug. 4, 1960, p. 123-128.

12535 Thermal Stresses in Design. XXI. Effect of Mean Stress and Strain on Cyclic Life. Discusses mean and alternating stress components, effect of multiaxiality, and prestrain in plastic range. ***S. S. Manson.*** *Machine Design,* v. 32, Aug. 4, 1960, p. 129-135.

12536 Mechanisms and Motion. Discusses vector methods in kinematics, general motion of rigid bodies, velocity and acceleration of hinged plane mechanisms, degrees of freedom of rigid bodies, constrained plane motion, plane mechanisms with sliding and higher pairs, and space mechanisms. ***K. H. Hunt.*** 114 pp. 1959. John Wiley & Sons, New York. (TJ175 H91m)

12537 How to Predict Buckling and Unseating of Coil Springs. Gives equations for predicting what happens when a coil spring is compressed between parallel or nonparallel plates. The theory is confirmed by test results, and a sample problem shows how to put the equations to work. ***T. M. Lowery.*** *Product Engineering,* v. 31, no. 29, July 18, 1960, p. 62-66.

12538 Response of Shallow Viscoelastic Spherical Shells to Time-Dependent Axisymmetric Loads. The medium is assumed homogeneous and isotropic. The solutions, employing differential equations governing the transverse motion of thin shallow elastic shells, are obtained with the joint use of the Laplace and the Hankel transforms, which, by interchanging the order of the inversions, avoid an otherwise intricate task of contour integration in the complex transform-plane. ***P. M. Naghdi and W. C. Orthwein.*** *Quarterly of Applied Mathematics,* v. 18, no. 2, July 1960, p. 107-121.

12539 Plate Design for Minimum Weight. Discusses equations determining the minimum weight design of transversely loaded sandwich plates. By means of an inverse method, the solution for an elliptical plate clamped around its edge is derived. ***R. T. Shield.*** *Quarterly of Applied Mathematics,* v. 18, no. 2, July 1960, p. 131-144.

12540 On the Steady-State Thermoelastic Problem for the Half-Space and the Thick Plate. The problem is treated as one in the classical theory of elasticity. The method of solution employed is that of double Fourier transforms. A general solution, corresponding to an arbitrary temperature field, is obtained in the form of double integrals and it is confirmed that the stress field is plane and parallel to the boundary of the medium. ***I. N. Sneddon and F. J. Lockett.*** *Quarterly of Applied Mathematics,* v. 18, no. 2, July 1960, p. 145-153.

12541 Structural Mechanics. Proceedings of the First Symposium on Naval Structural Mechanics. Discusses the design of structures for ships of the U. S. Navy, trends in materials to meet problems of structural mechanics, recent developments in the linear theory of elasticity, shell theory, instability of thin elastic shells, finite elasticity, waves and vibrations in isotropic elastic plates, and other problems. ***J. Norman Goodier and Nicholas J. Hoff, editors.*** 594 pp. 1960. Pergamon Press, New York. (VM156 Sy68s)

12542 Transient Temperature in a Semi-Infinite, Porous Solid With Phase Change and Transpiration Effects. Solutions are given for the transient temperature distribution in a semi-infinite solid whose interconnected pores were initially filled with a material which undergoes a phase change, and, because of the resulting change in density, streams or transpires toward the accessible surface. The possibility that several phase changes can occur is considered along with variations in thermal properties from one phase to another. ***Richard J. Grosh.*** *U. S. Air Force, Wright Air Development Division, WADD Technical Report* 60-105, Jan. 1960, 24 pp. (TL507 Un3.18w Vis.)

12543 Creep Bending and Buckling of Thin Circular Cylindrical Shells. A number of circular cylindrical shells manufactured of 5052-0 aluminum alloy were tested in pure bending, most at a temperature of 500 F, but a few at room temperature. All the specimens not subjected to static tests failed by creep buckling. Results are presented in tables and diagrams. ***Burton Erickson, et al.*** *U. S. National Aeronautics and Space Administration, Technical Note, NASA TN*-D-429, June 1960, 49 pp. (TL570 Un3t Room 290)

12544* Upper and Lower Bounds for the Center of Flexure. There is disagreement in the literature as to how the center of flexure of an isotropic elastic beam should be defined. In either of the two most widely accepted definitions, upper and lower bounds for the coordinates of the center of flexure are obtained. ***Lawrence E. Payne.*** *U. S. National Bureau of Standards, Journal of Research, Section B, Mathematics and Mathematical Physics,* v. 64B, no. 2, Apr.-June 1960, p. 105-111.

12545* On the Strength Behavior of Binary Structural Elements. Formulas are developed to apply where the loading of a binary structural element comprises a longitudinal force and a bending moment. Stresses and deformation can be calculated. (*In German.*) Zum Festigkeitsverhalten von Zweistoff-Bauelementen. ***Kurt Schmidt.*** *VDI Zeitschrift,* v. 102, no. 20, July 11, 1960, p. 829-840.

See also: **12920** (design of brazed joints for high-temperature service).

METALLURGY

12546* Around the Shipyards. Copper and Its Alloys in Marine Engineering Today. ***A. D. Fitness.*** *Copper,* no. 9, Summer 1960, p. 2-5.

12547* Common Stainless Steels. Steels with 17% C and 18-10 steels were studied from the point-of-view of their characteristics, structure, principal treatments, corrosion resistance, as well as of such processes as stamping, welding, polishing, and finishing. Many applications are mentioned. Finished products will be the main aim of production during next years. (*In French.*) Aciers inoxydables courants. ***M. L. Guitton.*** *Corrosion et Anticorrosion,* v. 8, no. 7, July-Aug. 1960, p. 262-281.

12548 Extractive and Physical Metallurgy of Plutonium and Its Alloys. Based on a symposium held in San Francisco, Calif., Feb. 16-17, 1959. Alternative routes for the conversion of plutonium salts to metal and their recovery problems, Ca reduction of plutonium halides to metal, preparation of metallic plutonium, distribution of plutonium and selected impurity elements between nitrate solutions and tri-*n*-butyl phosphate, some principles of the alloying behavior of Pu, Pu-Ce phase diagrams, and other problems are discussed. ***W. D. Wilkinson, editor.*** 314 pp. 1960. Interscience Publishers, New York. (TN693.P9 Am35.5e)

12549* On V. A. Pasuchin's and N. V. Korovin's Proposals Concerning the Metal Classification. The following classification of metals is proposed: (1) Ferrous; Fe (steel, cast iron). (2) Ferro-alloys and high melting; Ni, Co, Mn, Cr, V, W, Mo, Ta, Nb, Ti, Zr, and Si. (3) Heavy non-ferrous; Cu, Pb, Zn, Cb, Sn, Sb, Bi, Hg, and As. (4) Lightweight metals; Al, Mg, Ca, Sr, Ba, Be, Na, K, Li, Cs, and Rb. (5) Noble (valuable); Ag, Au, Pt, Pd, Ir, Rh, Os, and Ru. (6) Rare and scattered; Ga, In, Ge, Tl, La, Ce, other Lantharides, Sc, Y, Se, Te, and Re. (7) Fissible; Ra, Ac, Th, Po, U, and other actinides, radioactive isotopes of other elements. (*In Russian.*) O predlozheniiakh V. A. Pazukhina i N. V. Korovina po klassifikatsii metallov. ***Yu. V. Baymakov.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, TSvetnaia Metallurgiia,* 1960, no. 3, p. 49-50.

12550* On Metal Classification. The author proposes the following classification of metals: ferrous, heavy, light-weight, noble, small, alloying, alkaline and alkaline-earth, rare-earth, and radioactive. (*In Russian.*) Otnositel'no klassifikatsii metallov. ***B. V. Lipin.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no. 3, p. 51-53.

12551 High-Temperature Metals. Surveys extraction processes, fabrication, properties, and applications of Cr, Cb, Hf, Mo, Re, Sc, Ta, W, V, Y, and Pt-group metals. ***C. A. Krier.*** *Journal of Metals,* v. 12, July 1960, p. 574-576.

12552 Design and Fabrication Properties of High-Strength Steels. Considers the following structural materials for the range 180,000 to 300,000 psi: low-alloy hardenable steels, chromium hot-work die steels, martensitic stainless steels, semi-austenitic stainless steels, cold-rolled austenitic stainless steels. Discusses mechanical properties and effect of alloying additions, workability, and applications. ***A. M. Hall.*** *Machine Design,* v. 32, July 21, 1960, p. 174 + 4 pages.

12553 Malleable Iron Castings. Discusses history of malleable iron, the use of malleable iron castings, the products of the malleable castings industry, physical properties of standard malleable iron, mechanical and engineering properties of standard malleable iron, pearlitic malleable iron, alloyed malleable irons, the design of malleable iron castings, the manufacture of malleable iron castings, machining malleable iron, and the metallurgy of malleable iron. 526 pp. 1960. Malleable Founders Society, Cleveland, Ohio. (TS230 M29m)

12554* Vanadium in Steel. New British high-speed steels with a relatively high proportion of V in their composition which will take the place of some of the older steels. Considers important alloying effects. Gives some developments in the use of V over the past four or five years. *Mechanical World and Engineering Record,* v. 140, July 1960, p. 285-286.

12555 Columbium Alloys Today. Considerations in Design and Fabrication of Structures. Work is progressing rapidly to develop data needed on properties of columbium alloys for elevated-temperature applications. Tests show weldability to be excellent and coating systems indicate reliability. ***L. P. Jahnke, R. G. Frank, and T. K. Redden.*** *Metal Progress,* v. 78, no. 1, July 1960, p. 76-80.

12556* "Fibre" Metals. A new porous metal product was developed by the Armour Research Foundation of Illinois Institute of Technology. The process, called "fiber metallurgy", enables the product to be manufactured in the form of continuous sheet or in intricate shapes, and promises to become a useful asset to the filter industry as well as in numerous special structural applications. *Metal Treatment and Drop Forging,* v. 27, July 1960, p. 291-293.

12557* Rhenium. The use of Re is restricted by price and scarcity, but the outstanding properties of alloys of this refractory metal are leading to its utilization in specialized applications. ***John Port.*** *Metal Treatment and Drop Forging,* v. 27, July 1960, p. 294-295.

12558* Steel—New Developments for Missile Requirements. Pack-rolling technology, which also permits cross-rolling, has produced high-strength steel sheet of exceptional size for solid-fuel missile engine casings; pack-pressing, stainless steel domes for ICBM rocket motors; applications of T-1 steel and others—all from Lukens steel company. ***Joseph H. Proctor.*** *Missile Design & Development,* v. 6, July 1960, p. 42-43.

12559 Molybdenum Metal. This metals' high m.p., low specific heat, excellent thermo-shock resistance, good electrical conductivity, and high corrosion resistance to specific media, make it attractive from many engineering aspects. Revised information on arc-casting and powder metallurgical processes, together with up-to-date data on commercially available forms, physical and mechanical properties. 110 pp. 1960. Climax Molybdenum Co., New York. (TN799.M7 C61mo Over.)

12560* The Aluminum-Magnesium Casting Alloy With 11% Mg. Studies the problems arising with melting (deoxydation and degassing) and casting. Shows that an addition of Mn stabilized for at least two years the mechanical properties of the rolled metal obtained from super-purity Al. As regards cast A-G11, proof of this stabilization still remains to be given. Due to the processing difficulties it offers, this alloy with 10-12% Mg can only be used by a very restricted number of highly skilled foundries. (*In French.*) L'alliage de fonderie aluminium-magnésium a 11% Mg. ***Louis Grand.*** *Revue de l'Aluminium,* v. 37, no. 276, May 1960, p. 585-593.

12561* Determination of Oxides in Steels. Describes the work which was carried out on the identification and determination of the oxides in steels by a vacuum fractional reduction method at stepped temperatures and by the method of residues. The results agree with each other and the two methods are complementary. (*In French.*) Dosage des oxydes dans les aciers. ***P. Torterat, L. Bäcker, and E. Herzog.*** *Revue de Métallurgie, Mémoires Scientifiques,* v. 57, no. 7, July 1960, p. 493-501.

12562* Symposium on Iron and Steel Industry in India. Discusses: the role of national metallurgical laboratory in ferrous metallurgical research, operational research in the iron and steel industry, trend of steel demand in India, blast-furnace burden preparation with reference to high ash coke, principal mineral raw materials for iron and steel industry, studies in the sintering permeability and pellet strength of Australian hematite ores, principal aspects of investigations into fluidized carbonization undertaken at the Marienan experimental station, steelmaking by injection of O and lime powder Irsid-O.L.P. process, and other problems. 515 pp. 1959. The National Metallurgical Laboratory, Council of Scientific & Industrial Research, Jamshedpur, India. (TN704.I4 Sy68t Over.)

12563 Tin and Its Alloys. Discusses tin in cast and wrought forms, physical metallurgy of tin and tin alloys, chemical behavior of tin, electrodeposition of tin and its alloys, hot-tinning, tinplate, tin in bearing alloys, die-casting and other tin alloys, solders, and bronzes. ***Ernest S. Hedges.*** 424 pp. 1960. Edward Arnold and Co., London. (TN793 H35t)

12564 Applications of a Small Electronic Digital Computer to Pyrometallurgical Research. A small electronic digital computer employing punched cards was used to facilitate the solution of a variety of problems in Bureau of Mines pyrometallurgical research. In this work, the computer was found to be economical for solving both simple problems and those involving complex or iterative calculations. ***R. J. Leary, R. W. Smith, Jr., and B. J. Mitchel.*** *U. S. Bureau of Mines Information Circular* 7959, 1960, 26 pp. (TN21 Un3i Vis.)

See also: **12715** (nickel-base alloy dispersion-hardened by alumina).

METALS—CORROSION

12565* Study of Corrosive and Electrochemical Behavior of Stainless Steels by Cathodic Polarization in Nitric Acid Solutions. Report I. Characteristic of Self-Dissolution of Steel. The cathodic polarization was a function of the potential, of the acid concentration and of the temperature involved. The self-dissolution process had a solution retarding effect due to the delay in the supply of acid to the steel surface. (*In Russian.*) Izuchenie korrozionnogo i elektrokhimicheskogo povedeniia nerzhaveiushchikh staleĭ pri katodnoĭ poliarizatsii v rastvorakh azotnoĭ kisloty. Soobshchenie 1. Osobennosti samorastvoreniia staleĭ. ***E. N. Miroliubov, M. M. Kurtepov, and N. D. Tomashov.*** *Akademiia Nauk SSSR, Izvestiia, Otdelenie Khimicheskikh Nauk*, 1960, no. 6, June, p. 1015-1021.

12566* The Attack of Fe Saturated Zn Melts on Fe Containing Cr and Ni. Increase of the Cr and Ni contents in Fe causes expansion of the critical temperature field of the Zn attack which is increased and rectilinearly progressing in time. This temperature field extends from 495-515 C in the case of soft Fe. With an 11.6% Cr content, the field extends from about 465-520 C. With Ni contents beyond 5%, the entire field extends from 440-550 C. (*In German.*) Der Angriff eisengesättigter Zinkschmelzen auf chrom- und nickelhaltiges Eisen. ***Dietrich Horstmann.*** *Archiv für das Eisenhüttenwesen*, v. 31, no. 7, July 1960, p. 405-410.

12567* The Influence of Sodium Chloride Concentration on the Corrosion of Zinc. The rate of corrosion of Zn in preliminary stages increases with the increasing concentration of NaCl in the solution. The corrosion rate for individual cases decreases with time. The potential of the corroding specimen decreases with the increasing concentration of NaCl. The potential of the corroding sample decreases with time. (*In Polish.*) Wpływ stężenia chlorku sodowego na korozję cynku. ***Jerzy Sędzimir and Michalina Gmytryk.*** *Archiwum Hutnictwa*, v. 5, no. 1, 1960, p. 117-135.

12568 Salt Refinery Corrosion Caused by Varying Evaporator Conditions. Effect of temperature and different operating conditions in multi-effect NaCl evaporators. Some of the different corrosion effects that can be expected of Monel, copper alloys, stainless steels, and other metals are listed, with the corrosion rates achieved in a series of tests. ***John M. Turnbull.*** *Corrosion*, v. 16, July 1960, p. 11 + 3 pages.

12569 Refinery Corrosion Rates Below 5 mpy Achieved by Chromate Water Treatment. Describes water treatment tests conducted to control corrosion to a maximum of 5 mpy at a refinery's catalytic reformer. Compares corrosion rates obtained in two proprietary systems: chromate and phosphate. Analyses of well water used and the circulating water in the two treatments are tabulated. ***William A. Hess.*** *Corrosion*, v. 16, July 1960, p. 18-21.

12570 Some Corrosion Problems in Ships and Their Solutions. I. Looking at Hard-to-Reach Spaces and Thin-Gauge Hulls. II. Coating Systems Suitable for Thin-Scantling Construction. Use of thin scantling and thin shelled construction for high-speed ships makes the internal corrosion problem more important than ever. Mild steel hulls now generally used must have a coating of high integrity if they are to resist corrosion even when cathodic protection is provided. Examples of corrosion damage are reported because of poor coatings. Problems peculiar to space behind fitted instruments and furniture, especially those involving insulation are discussed. How decks corrode under covering presently used is described. ***R. S. Capp and B. J. Philibert.*** *Corrosion*, v. 16, July 1960, p. 22 + 8 pages.

12571 Reaction Velocity in the Corrosion of Iron by Hydrogen Sulfide and the Effect of Inhibitors. The rate of reaction of Fe and H_2S was studied in an O-free system in the presence of NaCl brine in the presence and absence of an oil phase under a constant mixing rate at 40 C and 80 C. The experimental data are plotted according to a previously derived equation for the iron-acetic acid system, and are shown to be in agreement with that equation. Another group of measurements on the Fe-H_2S system was carried out in the presence of corrosion inhibitors. There seems to be some possibility that good inhibitors function by forming a particularly efficient nonpermeable adsorbed film with FeS corrosion products. ***George S. Gardner.*** *Corrosion*, v. 16, July 1960, p. 84-90.

12572 Stress Corrosion Screening Tests of Materials for Steam Generator Tubing in Nuclear Power Plants. Stressed U-bend specimens were exposed for 24 hrs in a tilting autoclave to both the liquid and vapor phases of a high pH synthetic boiler water solution containing O, phosphate, and 500 ppm of chloride ion. The results indicate that AISI Type 347 stainless steel, the control material, and Carpenter 7Mo are about equally susceptible to stress corrosion cracking in this test environment. Carpenter 20Cb and Type 304 having low C and N content displayed improved resistance. Inconel, Monel, Ni, and Ti displayed complete resistance. Ferritic steels were crack resistant but they did suffer pitting attack. ***D. E. White and E. G. Johnson.*** *Corrosion*, v. 16, July 1960, p. 92-96.

12573 Stress Corrosion of Steels for Aircraft and Missiles. Atmospheric stress corrosion tests were conducted on alloy and stainless steels intended for use in high-speed aircraft and missiles. Results showed that very high strength alloys hardened by heat-treatment, like many nonferrous alloys used in conventional aircraft, are under certain conditions susceptible to atmospheric stress corrosion cracking. Tempering at temperatures of 1100 F and above confers resistance to stress corrosion. Test results also indicated that austenitic stainless steels hardened to very high strength levels by cold working are not susceptible. Protective coatings that are anodic to steel appear to be very effective in preventing stress corrosion. The microstructural characteristics of stress corrosion cracks in aircraft and missile steels are discussed. ***E. H. Phelps and A. W. Loginow.*** *Corrosion*, v. 16, July 1960, p. 97-107.

12574 Silicate as a Corrosion Inhibitor in Water Systems. Properly controlled, silicate treatment has eliminated rusty water, maintained satisfactory flow rates, and minimized failures due to pitting and to clogging by corrosion products. Comparative field experiments have demonstrated its effectiveness. Studies of the protective mechanism show that it involves formation of a thin film containing both silica gel and an absorption compound of silica and the metal hydroxide. ***Henry L. Shuldener and Sidney Sussman.*** *Corrosion*, v. 16, July 1960, p. 126-130.

12575 Effect of Composition and Heat Treatment on the Stress Corrosion Cracking of Austenitic Stainless Steels. Of the commercial alloys tested, Types 310 and 314 stainless steel offered considerably greater resistance to cracking than the more commonly used 304, 316, and 347 grades. These grades not only showed longer times to crack for the same applied stress but indicated higher threshold stresses below which cracking would not be expected to occur. Resistance to cracking increased with both Ni and Si content but was generally unaffected by C, N, Mn, and Cr contents within commercial limits. Data suggest that stress corrosion cracking in these alloys is both electrochemical and mechanical in nature. ***E. E. Denhard, Jr.*** *Corrosion*, v. 16, July 1960, p. 131-141.

12576 Hydrogen Pickup in Various Zirconium Alloys During Corrosion Exposure in High-Temperature Water and Steam. The H pickup during corrosion in high-temperature water and steam of various binary and ternary alloys of Zr with Fe and Sn was studied. The total H content of specimens exposed to 400 C steam was found to be greater than that of specimens exposed to 360 C water. Futhermore, the per cent

of theoretical H absorbed in the various alloys was markedly affected by the binary or ternary alloy addition. ***Stanley Kass.*** *Electrochemical Society, Journal*, v. 107, July 1960, p. 594-597.

12577 Kinetics of the Oxidation of Pure Tungsten From 500° to 1300°C. Kinetic studies were made on the oxidation of W from 500 to 1300 C for time periods up to 6 hrs, and for O pressures from 0.1 atm to 0.00132 atm. The rate data were fitted to the parabolic rate law. A number of deviations and transitions were observed. Above 1200 C, the oxidation reaction is similar to the combustion of graphite. The rate of oxidation is limited by the volatility of WO_3, the diffusion of O to the surface, and the diffusion of W_2O_5 away from the surface. ***E. A. Gulbransen and K. F. Andrew.*** *Electrochemical Society, Journal*, v. 107, July 1960, p. 619-628.

12578 Oxidation Properties of Tantalum Between 400° and 530°C. The rate of oxidation of Ta in 1 atm of purified O was measured at three temperatures between 475 and 530 C. The oxide was initially protective but became nonprotective as oxidation progressed. This kinetic behavior was correlated with metallographic and electron optical studies of oxidized Ta specimens, and it was shown that the oxide films became nonprotective through the formation of microscopic blister-like cracks in the oxide. A comparison between the oxidation characteristics of Ta and Nb is given. ***J. V. Cathcart, R. Bakish, and D. R. Norton.*** *Electrochemical Society, Journal*, v. 107, Aug. 1960, p. 668-670.

12579* The Rusting of Cu-Al Containing Fe. Different alloy compositions were developed or cast under various conditions. The chemical compositions of the particles were determined in several cases. Resistance to selective dissociation must be connected with the chemical composition of these particles. The test shows that the dissolution of the particles, or rusting, does not cause any loss of Al. (*In French.*) L'enrouillement des cupro-aluminiums au fer. ***Pierre-Julien Le Thomas, Dominique Arnaud, and Andrée Lethuillier.*** *Fonderie*, no. 174, July 1960, p. 279-288.

12580 Influence of the Silicon in Cast Iron on Corrosive Wear. Introduces background to the investigations reported and gives a brief assessment of the problem of wear. Relate various series of experiments and results obtained from them, in different localities. These include work on marine-diesel cylinder-liners and devising of corrosion tests on a series of cast irons of controlled structures and varying Si content. The practical aspects of whether or not sound, machinable castings can be manufactured in low-Si materials for the purposes described are not covered. Study confined to one type of microstructure. ***R. Graham, O. S. Prado, M. H. Collins, E. A. Brandes, and H. K. Farmery.*** *Foundry Trade Journal*, v. 108, June 30, 1960, p. 805-811.

12581* Corrosion Behavior of Iron Carbon Alloys Up to 4% C in Aqueous Solutions. In order to explain the different corrosion behavior of cast iron and steel, tests were conducted in tap water, artificial sea water and in salt solutions, with and without the aid of an electric current. The effects of the metal matrix, of graphite and its formation, and of a Ni addition to cast iron were observed. (*In German.*) Zum Korrosionsverhalten von Eisen-Kohlenstoff-Legierungen bis 4% C in wässerigen Lösungen. ***Peter Speidel and Adalbert Wittmoser.*** *Giesserei, Technisch-Wissenschaftliche Beihefte*, no. 29, July 1960, p. 1607-1615.

12582* Internal Oxidaiton of Silver and Silver Alloys. II. Internal Oxidation of Silver Alloys With Base Metals Forming No Solid Solutions With Silver. Ag-Cr and Ag-Ti alloys were used for the study of internal oxidation in Ag-rich alloys and the dangers and the practical elimination of this oxidation were examined. (*In German.*) Die innere Oxydation von Silber und Silberlegierungen. II. Innere Oxydation von Silberlegierungen mit Unedelmetallen, die mit Silber keine Mischkristalle bilden. ***H. Spengler.*** *Metall*, v. 14, July 1960, p. 685-686.

12583* Corrosion Control by Anodic Protection. Shows that, with adequate laboratory work beforehand and proper instrumentation, the use of anodic protection can make an effective contribution to the life of a chemical plant. ***C. Edeleanu.*** *Platinum Metals Reviews*, v. 4, no. 3, July 1960, p. 86-91.

12584 Materials of Construction for Handling Fluorine. No material is completely inert to attack by this element, but the handling of either liquid or gaseous F is not nearly as much of a problem as was once believed. The sensitive elements Si, V, Re, and U are attacked even below room temperature. Metals which can be used with liquid F are Ni and nickel alloys, stainless steels, Al, Mg, mild steel, Ti, Ta, and Zr. The fluorocarbons are the only organic materials of general application. ***Earl L. White and Frederick W. Fink.*** Paper from "Proceedings of the Propellant Thermodynamics and Handling Conference", p. 161-181, June 1960. Engineering Experiment Station, Ohio State University, Columbus, Ohio. (TL785 P94p)

12585* Embrittlement and Fractures of Steels Subjected to Stress in Saturated Solutions of H_2S. Studies the influence of H_2S content on embrittlement in the absence of stress and on the velocity of rupture under stress in the case of mild steels not stabilized with Ti, a soft Cr-Al-Mo-V steel and medium-strength Mn-Mo and Cr-Mo steels. (*In French.*) Fragilisation et rupture d'aciers soumis aux contraintes dans les solutions saturées d'H_2S. ***E. Herzog and E. Malinowski.*** *Revue de Métallurgie, Mémories Scientifiques*, v. 57, no. 7, July 1960, p. 535-549.

12586 Development of Corrosion-Resistant Niobium-Base Alloys. The hot-water corrosion resistance and mechanical properties of Nb and a number of its alloys were evaluated with a view toward determining their usefulness in pressurized-water thermal reactors. Unalloyed Nb is rapidly attacked by 600 and 680 F water and 750 F steam. However, a number of alloying additions were found which markedly improve the corrosion resistance of Nb. Of these, binary and ternary combinations of Cr, Mo, Ti, V, and Zr were among the most effective. Many of these alloys show as low or lower weight gains than those obtained for Zircaloy-2 under similar test conditions. ***Daniel J. Maykuth, William D. Klopp, Robert I. Jaffee, Warren E. Berry, and Frederick W. Fink.*** *U. S. Atomic Energy Commission, BMI*-1437, May 12, 1960, 90 pp. (UF767 U3b Contin.)

12587* Corrosion of Zinc in Sodium Chloride Solutions. Corrosion tests were carried out with 99.99 pC Zn in distilled water and in NaCl solutions with 30, 90, and 200 gram of NaCl per litre at 25 C. The quantity of corroded metal was determined polarographically after tests lasting 20, 40, 80, 160 and 320 minutes. In addition, the O and CO_2 content of the different solutions was determined, and the potential of the corroding Zn specimens was measured. (*In German.*) Korrosion von Zink in NaCl-Lösungen. ***Jerzy Sedzimir and Michael Gmytryk.*** *Werkstoffe und Korrosion*, v. 11, July 1960, p. 410-416.

See also: **12203** (corrosion resistance of zinc coatings).

METALS—EXTRACTION AND REFINING

12588* Effects of Lower Titanium Oxides and Calcium Oxides on the Properties of High Titanium Slags. A study of the TiO_2-Ti_2O_3-CaO system with 4% SiO_2, 2% Al_2O_3, and 2% MgO revealed that CaO definitely decreases the viscosity and melting capacity of Ti slag with any content of lower Ti oxides. Ti_2O_3 increases viscosity and melting capacity with any CaO content. In order to obtain slags containing 5% CaO between 1550 and 1600 C (melting temperature), a degree of reduction up to 1.5 is admissible for Ti_2O_3:TiO_2. (*In Russian.*) Vliianie nizshikh okislov titana i okisi kal'tsiia na svoĭstva vysokotitanovykh shlakov. ***I. A. Kariazin and V. A. Resnichenko.*** *Akademiia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Izvestiia, Metallurgiia i Toplivo*, 1960, no. 3, May-June, p. 28-34.

12589* Refining of Nickel Concentrate From Iron. During the melting of a Ni concentrate occurring during the separation due to flotation of the intermediate metal sulfide product obtained in bessemerization of mattes, between 700 and 1200 C, melting produces a sulfide and a clinkered layer. The Ni, Cu, and S content in the clinker decreases with the temperature increase. The Ni, Cu, Co, and S content in the sulfide product remains the same under the conditions of temperature studied. (*In Russian.*) Rafinirovanie nikelevogo kontsentrata ot zheleza. ***Iu. V. Alekseev.*** *Akademiia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Izvestiia, Metallurgiia i Toplivo*, 1960, no. 3, May-June, p. 35-38.

12590* The Zonal Smelting of Iron and the Determination of the Distribution Coefficients of Carbon, Phosphorus, Sulfur and Oxygen. Discusses the theory of zonal smelting and of processes of solidification of Fe, determination of the actual distribution coefficients of C, P, S and O on zonal smelting of Fe at different feeding velocities in the smelting zone, comparison with the theoretical distribution coefficients and significance of the zonal smelting for production of high purity Fe. (*In German.*) Das Zonenschmelzen von Eisen und die Ermittlung der Verteilungskoeffizienten für Kohlenstoff, Phosphor, Schwefel und Sauerstoff. ***Wilhelm Anton Fischer, Horst Spitzer, and Makato Hishinuma.*** *Archiv für das Eisenhüttenwesen,* v. 31, no. 6, June 1960, p. 365-371.

12591* Predicting Effects of Oxygen, Moisture and Fuel Additions on Blast Furnace Operation With Electronic Computers. A mathematical model for simulating the blast furnace with electronic computers was developed. Studies made on 15 blast furnaces indicate various optimum conditions involving O enrichment, blast temperature, and fuel injection. This study also shows quantitative effects of all blast variables and, in addition, show important effects resulting from changes in charge materials, product composition, beneficiation, pressurization and furnace design characteristics (such as water cooling, etc.). ***A. L. Hodge.*** *Blast Furnace and Steel Plant,* v. 48, July 1960, p. 665 + 11 pages.

12592* Developments in Acid Bessemer Steelmaking. Discusses certain aspects of the acid Bessemer process: instrumentation; nature of fume; low P for seamless pipe; free-machining steels, including leaded steels, high carbon steel strapping, buttweld and seamless steel pipe, low N steel, and embrittlement of steel. Describes important and new uses of acid Bessemer steel. Discusses the role of N in carbon steel. ***A. B. Wilder.*** *Blast Furnace and Steel Plant,* v. 48, July 1960, p. 679-689.

12593* Some Features of Basic Oxygen Steelmaking With Basic Hot Blast Cupolas. ***E. R. Richard.*** *Blast Furnace and Steel Plant,* v. 48, Aug. 1960, p. 820 + 3 pages.

12594 Alloy Steel Resists Abrasion in Rotary Hearth Furnace. Use of an alloy steel for the supporting ring and drive mechanism of the rotary hearth is an important factor in the simplicity of design and economy of operation of a unique high-temperature furnace for testing refractories. *Ceramic Age,* v. 76, no. 1, July 1960, p. 29.

12595* Working Conditions and Efficiency of Large Electric Arc Furnaces. On the basis of theoretical considerations, the working conditions of large-capacity electric arc furnaces used in steelworks are derived. The operating results of a modern 80-ton arc furnace are given. (*In German.*) Arbeitsbedingungen und Wirkungsgrad grosser Lichtbogenstahlschmelzöfen. ***H. -J. Forst.*** *Elektrowärme,* v. 18, June 1960, p. 192-196.

12596* Correlations Between the Quality Parameters of Metallurgical Cokes. Study of the properties of operating and laboratory cokes based on the results of X-ray analysis, microscopic analysis, specific surface and wetting heat measuring, on the results of differential thermal analysis, thermogravimetric analysis in oxidizing medium and on electric conductivity measuring. The principles of different methods are briefly explained. (*In Czech.*) Vzájemné vztahy jakostních parametrů hutnických koksů. ***M. F. Kessler and V. Večeřiková.*** *Hutnické Listy,* v. 15, no. 7, July 1960, p. 503-506.

12597 Lance Mixes Fuel and Oxygen to Boost Steel Production. Temperatures up to 5000° were obtained over usual open hearth practice. Installation of lances is claimed to present no major problems in modification of existing-furnaces. Application can be extended to any melt-down or refining operation—ferrous or nonferrous. ***C. L. Kobrin.*** *Iron Age,* v. 186, no. 4, July 28, 1960, p. 75-77.

12598 The Role of Carbon as a Deoxidizing Agent in the Production of Vacuum-Melted Steel. A series of steel melts with C contents up to 0.85% were made under vacuum in magnesia refractory crucibles. The influence of the time of vacuum treatment and of agitation, by either rocking the crucible or by Ar-lancing, on the degree of deoxidation of the melts by C was examined. A mechanism is proposed for the deoxidation process which indicates that a true dynamic equilibrium condition is eventually attained, giving final O contents corresponding to equilibrium with a carbon monoxide partial pressure of about 2 cm Hg. Lower O contents are therefore unlikely to be attained in magnesia crucibles. ***G. H. J. Bennett, and H. T. Protheroe, and R. G. Ward.*** *Iron and Steel Institute, Journal,* v. 195, pt. 2, June 1960, p. 174-179.

12599 Desulphurization of Basic Electric Arc Furnace Steel by the Injection of Powdered Materials. Rapid desulphurization of steel to very low levels was achieved by the injection of powdered desulphurizing agents directly into the metal bath of a basic electric arc furnace. Reviews work which was carried out at BISRA using this technique and gives an indication of cost of the materials used. ***L. Marples and J. Pears.*** *Iron and Steel Institute, Journal,* v. 195, pt. 2, June 1960, p. 195-201.

12600 Improved Blast-Furnace Gas Cleaning. Investigations into a gas-cleaning plant serving two 27-ft blast-furnaces. The three-stage cleaning plant was unable to clean down to figures acceptable for underfiring coke-ovens and caused serious deposits in the power station boiler plant and gas mains. Alterations were made to the electro-precipitators and to the internals of the washers. As a result the final dust burden is now less than $\frac{1}{10}$ of the previous average figures. ***S. A. Lewitt.*** *Iron and Steel Institute, Journal,* v. 195, pt. 2, June 1960, p. 205-211.

12601* On the Mechanism of Copper Influence on Gold Precipitation From Cyanide Solutions. A mechanism of Cu influence on Au precipitation from cyanide solutions is proposed. It is found that complex ions of Cu, concentrated in the outer casing of the double layer of cathode sections of grains of Zn dust, are capable of reducing considerably the velocity of the electrochemical process of cementation of Au. The negative effect of Cu on the velocity of Au precipitation can be reduced by an increase of the concentration of the free cyanide in the solution. (*In Russian.*) K mekhanizmu vliianiia medi na osazhdenie zolota iz tsianistykh rastvorov. ***M. I. Alkatsev.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no. 3, p. 74-77.

12602* Influence of Slag Preroasting on the Process of Vanadium Extraction. The degree of oxidation of V in the converter slag increases with the increase of temperature (up to 950°), the duration of calcination, the concentration of O in the gaseous phase and with the decrease of the size of slag grains. On the calcination of non-oxidized slag with inactive alkaline additions (NaCl) the extraction process of V is limited by the stage of formation of vanadates; on calcination of the slag with active alkaline additions (K_2CO_3, $NaCO_3$, KCl) the extraction process of V is limited in the kinetic area by the oxidation stage of V. Therefore on addition of active alkalis the use of preliminarily oxidized slag is a substantial factor of intensification of the process. (*In Russian.*) Vliianie predvaritel'nogo obzhiga shlaka na protsess izvlecheniia vanadiia. ***V. V. Pechkovsky, S. A. Amirova, and M. I. Polotnyanshchikova.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no. 3, p. 97-101.

12603* Physical and Chemical Study on Interaction of Thorium Chloride With Alkali-Metal Chlorides and Cerium in Melts. The interaction of thorium chloride with Na, K, Cs and Ce chlorides was investigated by the method of thermic analysis. In the systems $ThCl_4$—MeCl the components form chemical compounds of the type $MeThCl_5$, Me_2ThCl_6, Me_3ThCl_7 (except the system $ThCl_4$—NaCl). The compound $NaThCl_5$ melts incongruently at 370°, $KThCl_5$ and Cs_2ThCl_6 melt congruently at 428 and 490° correspondingly, $NaThCl_6$ melts congruently at 360°, K_2ThCl_6 and $CsThCl_6$ melt incongruently at 406° and 573° correspondingly; K_3ThCl_7 and $CsThCl_7$ melt congruently at 705° and 720° correspondingly. The data of thermal analysis are confirmed by tensometric investigations of the system. It was shown that the thermal stability of thorium chloride compounds with alkaline metal chlorides change regularly, increasing from sodium chloride to cesium chloride. The fusibility in the systems $ThCl_4$-$CeCl_3$ and $ThCl_4$-$CeCl_3$-NaCl was investigated by the method of thermal analysis. (*In Russian.*) Fiziko-khimicheskoe izuchenie vzaimodeĭstviia khlorida toriia s khloridami shchelochnykh metallov i tseriia v

rasplavakh. ***V. I. Ionov, B. G. Korshunov, V. V. Kokorev, and I. S. Morosov.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no 3, p. 102-108.

12604* Influence of Niobium Pentaoxide Recrystallization on Its Reduction Rate. Shows that high-temperature calcination of Nb_2O_5 either in an oxidizing or reducing atmosphere leads to its recrystallization. It is noted that the change for the worse of kinetic indexes of the reducing process of Nb_2O_5 by H and C on use of preparations obtained by calcination of the hydroxide (or by oxidation of NbC) at high temperatures is to a considerable degree caused by the decrease of the reaction surfaces and the increase of diffusion passages in solid phase. (*In Russian.*) Vliianie rekristallizatsii piatiokisi niobiia na skorost' ee Vosstanovleniia. ***G. P. Shveykin, P. V. Geld, and V. D. Lynbimov.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no. 3, p. 120-125 + 3 plates.

12605* Obtaining Non-Ferrous Metals of High-Purity by Zone Melting. Besides widely used deep refining of Ge and Si, the refining of more than 20 elements is carried on by the method of zone melting. The suitability or non-suitability of zone melting of Al, Bi, Ga, In, Cu, Sn, Pb, Se, Ag, Sb, Te, Zn, Fe, Mo, Ni, Ti, Zr and U is discussed. (*In Russian.*) Poluchenie isvetnykh metallov vysokoĭ chistoty po metodu zonnoĭ plavki. ***V. N. Vigdorovich and A. E. Volpyan.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ TSvetnaia Metallurgiia,* 1960, no. 3, p. 126-135.

12606* Effect of Vibration of Melt on Structure of Aluminum-Silicon Alloy. The vibration of the melt causes changes of the inner structure of a fluid alloy and pulverizes the macrograins; a modified structure of Al-Si can be obtained by the vibration of the melt. The supposition of A. G. Spasskii and of V. V. Rogozin that the structure of a modified Al-Si alloy is a normal structure of the alloy was confirmed. It is possible to obtain a modified structure without additional introduction of a modifier, but the alloy first must be purified from insoluble admixtures. (*In Russian.*) Vliianie vibratsii rasplava na strukturu silumina. ***D. P. Lovtsov and G. D. Lyungershausen.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia,* 1960, no. 3, p. 148-150 + 1 plate.

12607 The Preparation of High Purity Vanadium Pentoxide by a Chlorination Procedure. Method includes reaction of the impure oxide with Cl and C, hydrolysis of the resultant $VOCl_3$ in aqueous NH_3, and ignition of the precipitated NH_4VO_3 at 500-600 C. V_2O_5 containing a maximum of *ca.* 100 p.p.m. impurities was produced in kg. quantities both cheaply and efficiently by this process. ***Robert E. McCarley and James W. Roddy.*** *Journal of the Less-Common Metals,* v. 2, no. 1, Feb. 1960, p. 29-35.

12608* Metallurgy in Nuclear Power Technology. I. Extraction and Fabrication of Uranium. First of a series of articles of general interest on nuclear metallurgy. ***J. C. Wright.*** *Metal Treatment and Drop Forging,* v. 27, July 1960, p. 265 + 10 pages.

12609* The Theory and Practice of Vacuum Melting. Extensive review article; stresses advantages of the process over others in melting very reactive, high-melting point metals. Tables, charts, diagrams, and 106 references. ***O. Winkler.*** *Metallurgical Reviews,* v. 5, no. 17, 1960, p. 1-117 + 8 plates.

12610* Melting Low-Alloy Steels Without Deoxidizing With Silicon in the Furnace. The production of low-alloy steel without preliminary deoxidation in the furnace with Si results in a substantial saving in ferro-alloys without any loss of steel quality. The amount of nonmetallic inclusions and H is even slightly less. ***I. M. Leikin, M. P. Sabiev, and V. A. Zhidkov.*** *Stal' in English,* 1960, no. 3, Mar., p. 178-181.

METALS—FINISHING, POLISHING, AND CLEANING

12611 The Nitric-Hydrofluoric Acid Pickling of Zircaloy-2. The dissolution of Zircaloy-2 was studied in the temperature range 15.6-37.8 C in unagitated and agitated hydrofluoric-nitric acid solutions. The dissolution rate was found to increase with HF concentration and agitation. The energy of activation does not depend on agitation. ***M. A. DeCrescente, P. F. Santora, A. S. Powell, and R. H. Gale.*** *Electrochemical Society, Journal,* v. 107, July 1960, p. 591-593.

12612* Precise Barrel Finishing. Describes methods, media, economics and applications. ***Ralph F. Enyedy.*** *Metal Finishing,* v. 58, July 1960, p. 85-90.

12613* Some Details of the Vibratory Finishing Process. Discusses details of the process, equipment, media and cutting compounds. *Metal Finishing Journal,* v. 6, no. 67, July 1960, p. 276-278.

12614 Studies on the Surface Treatment of Aluminium and Zinc. Results obtained in comparative corrosion and adhesion tests demonstrate that the chemical conversion coatings are of value in promoting the adhesion of paint to Al and in increasing corrosion resistance where service conditions are severe. For the best over-all protection of Zn against corrosion the chromate film from the CrO_3-$Cr_2(SO_4)_3$ solution is the one to choose. The paint adhesion for this film is not quite as good as that of a phosphate coating, but certainly a vast improvement over untreated material, whether the paint be air-drying or stoving. ***D. B. Freeman and A. M. Triggle.*** *Metal Industry,* v. 97, July 8, 1960, p. 28-30.

12615* Continuous Patenting and Pickling. Combination of different operations into one continuous process. Increase of productivity by raising annular weights of rolled wire. (*In German.*) Patentieren und Beizen im kontinuierlichen Verfahren. ***Hubert Klimm.*** *Neue Hütte,* v. 5, June 1960, p. 332-337.

12616 New Complete Finishing System. The new installation of the City Auto Stamping Company Division of Globe-Wernicke Industries, Inc., is described. *Products Finishing,* v. 24, no. 10, July 1960, p. 84-89.

See also: **12168** (surface treatment for tanks); **12199** (electrostatic spraying); **12238** (electropolishing, anodizing, and electrolytic pickling of metals).

METALS—FOUNDRY PRACTICE

12617* Effects of C and O on the Behavior of Some Elements Contained in Fe Melts Under a High Vacuum. Cu, S, P, As, and N in melts with initial contents from 0.001 to 3% C and 0.001-0.25% O under pressures between 10^{-5} and 10^{-3} Torr (mm Hg) were closely studied for the effects of C and O. The amount of metal used was 4.5-4.9 kg. The melting time was up to seven hr in crucibles of electric magnesia, electric corundum, dolomite, etc. Discusses the results with determination of the coefficient of distribution k and of the evaporation. (*In German.*) Einfluss von Kohlenstoff und Sauerstoff auf das Verhalten einiger Begleitelemente in Eisenschmelzen unter Hochvakuum. ***Wilhelm Anton Fischer and Alfred Hoffman.*** *Archiv für das Eisenhüttenwesen,* v. 31, no. 7, July 1960, p. 411-417.

12618 New Chevrolet Aluminum Foundry. Low pressure, permanent mold casting of Al components for the Corvair engine, a "first" for Chevrolet, is one of the distinctive techniques developed for the new Chevrolet Motor Division aluminum foundry at Massena, N. Y. ***Joseph Geschelin, editor.*** *Automotive Industries,* v. 123, no. 2, July 15, 1960, p. 70 + 5 pages.

12619* Vacuum Metallurgy Problem in Steelmaking. Covers development and possibilities of application of vacuum melting and casting processes involving one of the following methods: coreless induction furnace in vacuum with melting in vacuum, vacuum arc furnace process with self-consuming electrode, vacuum casting process applied to a steel melted in the usual way in open furnace atmosphere. (*In German.*) Probleme der Vakuummetallurgie in der Stahlherstellung. ***Josef Hofmaier.*** *Berg - und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben,* v. 105, no. 6, June 1960, p. 125-131.

12620* Manufacturing Processes. I. Melting and Casting. Copper-base foundry alloys—a general discussion. ***E. Voce.*** *Copper*, no. 9, Summer 1960, p. 22-25.

12621* Considerations on Argiles Used as Binders for Molding Sand. Describes internal structure of argiles made of Al silicates combined with water; study of importance of the transformation under cold conditions, role of combined water, external water layer and molding cohesion, effects of dissociation, and of "thixiotropy" and mechanical resistance. (*In Italian.*) Considerazioni sulle argille come leganti per sabbia. ***Rinaldo Cattaneo.*** *Fonderia*, v. 9, June 1960, p. 269-273.

12622* A Study of the Reduction of the Consumption of Carbon Dioxide Gas in the Agglomerating Technique of Sodium Silicate Sands. Study of the chemical and physical properties of sodium silicate, the setting process from the theoretical and practical viewpoint; optimum concentration of silicate, selection of the silica-sodium ratio, effects of the small size index of the sand, argile or soluble or insoluble products of addition and effects of the in-blowing pressure on consumption of CO_2 gas were determined. (*In French.*) Etude de la réduction de la consommation de gaz carbonique dans la technique d'agglomeration des sables au silicate de soude. ***Michel Jeancolas and Xavier Virolle.*** *Fonderie*, no. 173, June 1960, p. 239-251.

12623* pH, a New Factor for Controlling Molding Sands. III. Surface defect which appears in some cases on gray-iron castings and steel castings, when molding sand is intensively used after a long shutdown is controlled by measuring the acidity or basicity (alkalinity) of the sand mixture. The raise of the pH value by adding alkaline products to the return sand gives entirely satisfactory results. (*In French.*) Le pH, nouveau facteur de contrôle des sables de moulage. (Suite III.). ***J. Castells.*** *Fonderie Belge*, v. 30, July-Aug. 1960, p. 189-195.

12624 Risering of Steel Castings. Correct risering of steel castings involves two basic problems—riser location and riser dimensions. Risers must be located sufficiently close together so that all points of the casting are within the feeding range of a riser. ***H. F. Bishop.*** *Foundry*, v. 88, Aug. 1960, p. 75-79.

12625 Glass-Mould Manufacture at Dilworth & Carr, Limited. When it was realized that much of the "hoodoo" and secrecy surrounding glass-mold manufacture could be debunked, and a greatly expanded output was required, it was decided to install a mechanized production unit for making the molds in the existing iron foundry of Dilworth & Carr, Ltd.—one of the United Glass group of companies—at Preston. Historical notes on the Preston works, description of the new plant, and the way it had to be tailored to fit into a corner of the iron foundry. *Foundry Trade Journal*, v. 109, July 28, 1960, p. 99-103.

12626* The Penetration of Low-Melting Metals Into Molding Sand. Observations on the process of penetration of a tin-bismuth alloy, effect of pressure and temperature, penetration at a bath temperature between liquidus and solidus, penetration test with Sn of high purity (99.995%), determination of the temperature during the penetration, penetration tests with other metals and alloys, penetration in molds with a flat glass wall are discussed. (*In German.*) Das Eindrigen von Metallen mit niedrigem Schmelzpunkt in Formsand. ***K. Fursund.*** *Giesserei*, v. 47, no. 13, June 30, 1960, p. 347-357.

12627* Molding Sands With an Addition of Glycols, Particularly for Heavy Metal Castings. Glycols in molding sands as used up to now, effect of glycols on reactions between metal and molding material, glycol-bentonite molding sands for heavy metal castings and preparation and properties of glycol molding sands are discussed. (*In German.*) Formsande mit Zusatz von Glykolen, besonders für Schwermetallguss. ***Ernst Brunhuber and Wolfgang Büchen.*** *Giesserei*, v. 47, no. 13, June 30, 1960, p. 358-361.

12628* Full-Automatic Core Sand Preparation Plant and Novel Design. Discusses unloading pit-wet sands and storing them in silos, remote-controlled preliminary dosing of different sand types and pneumatic transport into the group of silos containing requirements of one day, pneumatic transport of binders in powder form, storing and transport of viscous core binders under the interaction of pressure and vacuum, full-automatic mixer group, automatic transport and remote-controlled distribution of prepared sands. (*In German.*) Neuartige vollautomatische Kernsandaufbereitungsanlage. ***Kurt Bandow and Rudolf Ritter.*** *Giesserei*, v. 47, no. 13, June 30, 1960, p. 362-364.

12629* Fabrication of Pressurized Castings From Copper Alloys. Shrinking behavior, H absorption and metal-mold reaction are very important in the case studied, hence special conditions for the choice of alloy, melting, desulfurizing, deoxidation and preparation of melts are required. Most appropriate for castings pieces impervious to liquid and gas are nickel alloyed bronze in sand casting, and Al-alloyed brass and Al bronze in chill casting. (*In German.*) Die Herstellung druckdichter Gussstücke aus Kupferlegierungen. ***Ernst Brunhuber.*** *Giesserei*, v. 47, no. 14, July 14, 1960, p. 371-377.

12630* Cores Made According to the Croning Process. Covers the development of the shell molding process, the fabrication of the cores, shell-molded cores in sand molds for gray iron castings, shell-molded cores for malleable iron, heavy metal, and die and steel castings. (*In German.*) Maskenkerne nach Croning. ***Hans Petrusch.*** *Giesserei*, v. 47, no. 15, July 28, 1960, p. 395-400.

12631* Direct-Chill Casting Method Improves Aluminum Alloys. ***R. R. Irving.*** *Iron Age*, v. 186, no. 4, July 28, 1960, p. 78-79.

12632 Italian Die-Casting Plants. The Aguzzioli and SIMI plants at Milan, Ferrari at Novara, Ruffini at Turin, Olivetti at Ivrea, Fiat at Turin, Innocenti at Milan, and the Necchi Works at Pavia are described. *Metal Industry*, v. 96, June 17, 1960, p. 500-502.

12633* Progress in Investment Casting. Review article; discusses evolution of shell molding, comparison of shells, their economies and possible future development. 29 references. ***Rawson L. Wood.*** *Metallurgical Reviews*, v. 5, no. 17, 1960, p. 119-135.

12634* Hollow Diecastings Offer New Scope. A method of producing almost completely enclosed hollow components by pressure diecasting that increases the scope of the process considerably. Offers the inherent advantages of slush casting—hitherto restricted to the use of gravity molds—while retaining the external accuracy, finish and high production characteristics associated with pressure diecasting. ***R. L. Ziar.*** *Metalworking Production*, v. 104, no. 28, July 13, 1960, p. 67 + 3 pages.

12635* Factors Contributing to Soundness of Titanium Castings. Identifies internal and surface defects in Ti castings and outlines ways to overcome these problems. Results indicate that Ti castings can be produced to consistently high-quality levels when design, gating, pouring and mold requirements are maintained. ***J. W. Smith and T. A. Hamm.*** *Modern Castings*, v. 38, July 1960, p. 51-60.

12636* High Strength Cast Steel Structure and Microporosity Effect on Mechanical Properties. Results show that microporosity has a drastic influence on the properties of high strength steel, and that it can be nearly eliminated by maintaining steep thermal gradients during solidification. Columnar zones of the test castings produced were found to be most ductile and least prone to microporosity. ***S. Z. Uram, M. C. Flemings, and H. F. Taylor.*** *Modern Castings*, v. 38, July 1960, p. 61-74.

12637* Oxygen-Gas Burner Used for Scrap Meltdown in the Small Arc Furnace. Initial trials of a new process to promote rapid and uniform scrap meltdown are discussed. While the O-gas burners were designed for large furnaces they have the possibility of being used as tools in the small arc. ***Vernon J. Howard.*** *Modern Castings*, v. 38, July 1960, p. 84-86.

12638* Compression Casting. Thin-walled parts are machine-cast with two convergent dies. This novel technique makes it possible to cast large thin-walled ribbed parts. Applications include ailerons, wing surfaces, fuselage sections, automobile hoods, railway car side and bottom panels, motor and river boat hulls, and wall facings for buildings. It lends itself to casting Zn, Mg, Cu, and even steel! Illustrated. ***A. J. Steiger.*** *Modern Castings*, v. 38, Aug. 1960, p. 34-37.

12639* Nickel Carbonyl Pattern Equipment. The nickel carbonyl process for producing pattern equipment is described, from the making of the master mold to the completed Ni pattern. Precautions in working with nickel carbonyl are given. The nickel carbonyl process produces high surface finishes and tolerances; its capabilities are unlimited within the foundry equipment field. ***J. O. Trimble.*** *Modern Castings*, v. 38, Aug. 1960, p. 65-68.

12640* Determination of the Resistance to Flow of a Mold for Cu Alloy Castings. The losses resulting from overcoming the resistance to flow may be revealed with the aid of the coefficient of loss or the coefficient of flow μ which gives the energy efficiency of flow and is related to the total coefficient of loss by an exact numerical relationship. Gives the μ coefficients for several Cu alloys, established in industrial conditions during the production of different castings. (*In Polish.*) Wyznaczenie oporu formy dla odlewów ze stopów miedzi. ***Zbigniew Górny and Władysława Kapera.*** *Przeglad Odlewnictwa*, v. 10, no. 6, June 1960, p. 165-168.

12641* The Efficiency of Furnace Oxidation and Its Effects on the Melting Technique of Copper Alloys. The maximum charge of O should 0.010 to 0.025 wt.% of O_2 and, if possible, employed through the firing conditions only. If the capacity of the furnace oxidation is not sufficient, oxidizing melting additions should be employed; the respective content of O-bearing compounds should be in accordance with the prevailing operating conditions. (*In German.*) Die Ofen-Oxydationsleistung und ihr Einfluss auf die Schmelztechnik von Kupferlegierungen. ***E. Brunhuber.*** *Radex Rundschau*, 1960, no. 3, June, p. 123-127.

12642* The Influence of Vacuum Casting on Some Properties of Steels (Sheet). Results of tests on thick sheet rolled down from two 30-ton ingots of the same melt. Ductility is clearly improved by the vacuum casting; elongation and compression are independent of the position and orientation of the specimen. (*In French.*) Influence de la coulée sous vide sur certaines propriétés des aciers (toles). ***L. Colombier and C. Royer.*** *Revue de Metallurgie*, v. 57, June 1960, p. 491-499.

12643* Improvement in Ingot Quality by Vibrations Produced During Solidification. Results are given of tests on bronze ingots and also high-speed steel ingots weighing up to 700 kg (mechanical vibrations) or 50 kg (magnetic vibrations). The main advantages are reduced carbide segregation, increased toughness and improved surface finish on machining. The magnetic vibrations penetrate more deeply, right to the base of the ingot. (*In French.*) Amélioration de la qualité des lingots au moyen de vibrations appliquées au cours de leur solidification. ***M. Ferrero and P. Ravizza.*** *Revue de Métallurgie*, v. 57, June 1960, p. 501-505.

12644* Investigation of Some Problems of "Hot Tops" Encountered in Steelworks. Proposes simple methods for determining which charge compositions should be used in steelworks to allow, if possible, complete elimination of the ingot "piping" or to minimize it in the cases when complete elimination cannot be expected. Diagrams show the mean loss of total recovery, which is due to the ingot "piping", when these charge compositions are used. (*In French.*) Études de quelques problèmes de "fausses coupes" se rencontrant dans les usines sidérurgiques. ***Y. Morillon and R. Rambach.*** *Revue de Métallurgie*, v. 57, June 1960, p. 529-531.

12645* Practical Application of the Sedimentation Analysis to Determine Foundry Dusts' Grain Structure. The application of Stoke's law in regard to sedimentation of dust particles in liquids was considered. Errors resulting from taking the average density for defining the grain structure of dusts which are not density-uniform, were experimentally determined. For testing purposes chemically pure oxides and heterogeneous dusts from non-ferrous smelting works were used. (*In Polish.*) Możliwości zastosowania analizy sedymentacyjnej do oznaczania uziarnienia pyłów hutniczych. ***Witold Gutowski.*** *Rudy i Metale Niezelazne*, v. 5, no. 6, June 1960, p. 223-227.

See also: **12734** (betatron used in foundry).

METALS—HEAT TREATMENT

12646* Electric Resistance Heating for Steel Treatment. Deals with a process involving direct resistance heating of steel rods for forging and subsequent heat treatment. The flat faces of the bar are laid in contact with Cu plates which are cooled by water sprays and low voltage (40 to 22) current passed through the bar. Installation details, including electrical connections and control are given. (*In German.*) Elektrische Widerstandserhitzung zur Verarbeitung von Stahl. ***W. Stich.*** *Elektrowärme*, v. 18, June 1960, p. 196-204.

12647 Bright Annealing Stainless Steel Strip in High Production Furnace of Advanced Design. General Electric Co. plans production of vertical electric furnace unit, complete with strip-handling equipment and controlled-atmosphere generators; systems will be available in 54- and 75-ft heights. Typical application for strip 24-in. wide, 6000 lb per hr. Strip widths of 12-, 36-, and 48-in. can also be processed. *Industrial Heating*, v. 27, July 1960, p. 1432 + 3 pages.

12648 Eutectic Alloying of Copper . . . A New Concept in Dispersion Hardening. When O (or S) is added to Cu so that a eutectic composition is formed, a fine dispersion of Cu_2O or Cu_2S will appear on solidification. Rupture tests prove that dispersions formed in this manner will harden and strengthen such alloys. ***D. N. Williams, J. W. Roberts, and R. I. Jaffee.*** *Metal Progress*, v. 78, no. 2, Aug. 1960, p. 108-109.

12649* Quenching Aluminium Sheet. Research engineers of the Aero Space Division of the Boeing Airplane Company in the U.S. recently developed a new technique for the elimination of heat-treatment distortion in thin-gage Al sheets utilizing die steel spacer springs. *Metal Treatment and Drop Forging*, v. 27, July 1960, p. 296.

12650* Preparation and Service of Magnesite Induction Furnace Crucibles With Clinkering Additions. Use of rammed magnesite masses with clinkering additions in the brick lining of the crucibles of induction furnaces increases their stability two to three times. The clinkering additions recommended are inexpensive and easily obtainable; the technique used in ramming is simple. (*In Russian.*) Izgotovlenie i sluzhba tigleĭ induktsionnykh pecheĭ iz magnezita so spekaiushchimi dobavkami. ***P. S. Mamykin and M. N. Kaĭbicheva.*** *Ogneupory*, v. 25, no. 7, 1960, p. 308-312.

12651* Influence of Heat Treatments on the Transformation of Carbides in Chromium-Molybdenum Steels. Applies the technique of electrochemical separation of carbides in order to study the influence of heat treatment on the transformation of phases in low-carbon Cr-Mo-Al-V steels. Shows the effect of Al on the appearance of the Cr_7C_3 type of chromium carbide and on the existence of a molybdenum carbide γ MoC. (*In French.*) Influence des traitements thermiques sur l'évolution des carbures dans les aciers au chrome-molybdène. ***L. Bäcker, R. Bigot, and E. Herzog.*** *Revue de Métallurgie Mémories Scientifiques*, v. 57, no. 7, July 1960, p. 527-534.

12652 Effect of Annealing Time and Working on Indicated Thickness of Uranium. An investigation was made into the effect of the length of time for which warm-rolled U sheet was salt annealed on the indicated sheet thickness obtained ultrasonically. Tests were also made to determine the effect of various per cent cold reductions on the apparent ultrasonic thickness. Test results and an analysis of their possible significance are included. ***Robert B. Burditt.*** *U. S. Atomic Energy Commission*, Y-1293, Dec. 31, 1959, 19 pp. (UF767 Un3.1y Contin.)

METALS—MECHANICAL AND PHYSICAL PROPERTIES

12653 Ultrasonic Scattering and Attenuation in Polycrystalline Copper and α-Brass. Specimens in the form of cylindrical rods were annealed to various grain sizes and tested at frequencies between 100 kc and 18 Mc, corresponding to

scatterer circumference to wavelength ratios ($\pi D/\Lambda$) from 10^{-3} to 1.6. Primary objectives were to study the scattering process by direct observation of the scattered radiation, and to study the associated attenuation under conditions not previously amenable to measurement; these included cases where pulse patterns were complicated by excessive scattering, and by mode dispersion. Comparison of the experimental data with the principal attenuation mechanisms operative at these frequencies showed the observed attenuation to vary over most of the range in the manner expected for elastic hysteresis damping. ***David W. Krautkopf.*** *Acoustical Society of America, Journal,* v. 32, July 1960, p. 824-835.

12654* Neodymium and Its Alloys With Aluminum. The 99.5% pure Nd revealed a hardness when cast of 46 kg/mm², a tensile strength in cold rolling with 70% reduction of 13 kg/mm², and a 1-2% Δ-plasticity. The compression strength of cast Nd is 25 kg/mm²; the plasticity under compression is 36%. Neodymium is slightly deformed in the cold or hot state. Repeated cold rolling and annealing at 500-600 C yielded a strip less than 0.5 mm in thickness. (*In Russian.*) Neodim i ego splavy s aliuminiem. ***E. M. Savitskii, E. S. Stepanov, and V. F. Telekhova.*** *Akademiia Nauk SSSR, Otdelenie Tekhnicheskikh Nauk, Izvestiia, Metallurgiia i Toplivo,* 1960, no. 3, May-June, p. 73-78.

12655* Investigation of the Course of the Wöhler-Lines and of the Defect-Lines of Steel Wires. Binding tests were made on spring steel and cast steel wires with a diameter of 1 to 4 mm and a C content of 0.41 to 0.89%. The influence of aging and surface conditions on the start of fracture and the size of the fatigue crack are discussed. (*In German.*) Untersuchungen über den Verlauf der Wöhler-Linien und der Schadenslinien von Stahldrähten. ***Max Hempel.*** *Archiv für das Eisenhüttenwesen,* v. 31, no. 6, June 1960, p. 373-383.

12656* Effects of the Thermal Treatment on the Limit Value of the Stress Rupture Strength of Austenitic Steel EI694R. Under equal test conditions (stress 25 kg/mm² and 610 C) the time for the change in structure of the specimens as a function of the conditions of thermal treatment changed from 663 to 7228 hr. The highest stress rupture strength was obtained by austenizing under the following conditions: heat to 1150-1170 C, soak for two minutes for each 1 mm² cross section, and quench in water. (*In Russian.*) Vliianie termicheskoi obrabotki na velichinu predela dlitel'noi prochnosti austenitnoi stali EI694R. ***A. A. Moiseev, T. F. Semenova, E. D. Surovtseva, and N. V. Sukhobokova.*** *Elektricheskie Stantsii,* v. 31, no. 6, June 1960, p. 24-26.

12657* Influence of Metallurgical Factors on Brittleness of Cast Steel With 13% Cr Melted in Arc Furnace. Nickel as austenite forming element suppresses the presence of the excessive delta-ferrite quantity. At the same time, it decreases the temperature Ac_1 as well as Ms. Therefore it is necessary to choose a lower tempering temperature and to take into account the possible presence of residual austenite in the structure after quenching. The best values of notch toughness have been reached with arc melt where FeCr was added before commencing reduction and in one lot. (*In Czech.*) Vliv metalurgických činitelů na křehkost odlitků z 13% chromové oceli tavené v obloukové peci. ***Jaroslav Koutský and František Kinský.*** *Hutnické Listy,* v. 15, no. 7, July 1960, p. 524-528.

12658* Effects of Overheating on Steel Properties. The degree of influence of preliminary overheating on the mechanical properties depends on the alloying capacity of steel, thickness of the initial billet, ratio of cross-sectional area of original piece of metal to area of drawn out billet, temperature interval of the pressure treatment, conditions of further cooling, subsequent thermal treatment, etc. The problem of the admissibility of overheating must be solved in relation to the combination of the above factors. (*In Russian.*) Vliianie peregreva na svoistva stali. ***N. N. Lipchin and Iu. A. Sobolev.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Chernaia Metallurgiia,* 1960, no. 5, p. 135-141.

12659* The Role of the Friction of the Ingot Against the Mold in the Formation of Hot Cracks. By means of a specially constructed device, the mechanism and kinetics of development of the friction forces in the case of free shrinkage were explained for different alloys. The absolute value of such forces depends on the factors determining the strength of the molds. In some cases these forces can cause the formation of hot cracks in ingots. (*In Russian.*) Rol' treniia otlivki o formu pri obrazovanii goriachikh treshchin. ***Iu. A. Stepanov.*** *Izvestiia Vysshikh Uchebnykh Zavedenii, Mashinostroenie,* 1960, no. 6, p. 86-94.

12660 Paramagnetic Susceptibilities of Fe and Fe-Si Alloys. At high temperatures the paramagnetic susceptibilities of bcc Fe-Si alloys obey the Curie-Weiss law, possibly indicating that the contribution due to *s-d* exchange interactions is small in comparison with the temperature dependent paramagnetism. The effective Bohr-magneton number of Fe from the high-temperature region is independent of Si content up to about 14 at.% Si. At higher Si concentrations, gradual decrease in the effective Bohr-magneton number occurs. ***Sigurds Arajs and D. S. Miller.*** *Journal of Applied Physics,* v. 31, June 1960, p. 986-991.

12661 A New Fracture Test for Alloy Steels. Notched bar fracture tests, such as the Charpy V-notch impact test, can be modified to simulate important characteristics of large spin bursting tests. Fracture toughness and appearances similar to those of large notched disks were obtained from specimens which were nitrided to produce a hard brittle case. ***D. L. Newhouse and B. M. Wundt.*** *Metal Progress,* v. 78, no. 1, July 1960, p. 81 + 3 pages.

12662 Tests for Determining Fracture Toughness of Sheet Alloys. Tabulates type of test, dimensions, pretest procedure, test procedure, and interpretation for eight different organizations. *Metal Progress,* v. 78, no. 2, Aug. 1960, p. 100-B.

12663* Some Effects of Grain-Size on the Mechanical Properties of Nimocast 258. Control of the grain-size of investment-cast test bars of Nimocast 258 was achieved by vacuum casting at predetermined pouring temperatures. Room-temperature tensile tests show that, within the grain-size range studied (0.5 mm-3 mm) there is little variation of strength and ductility. ***F. G. Haynes and D. R. Wood.*** *Metal Treatment and Drop Forging,* v. 27, June 1960, p. 219-223.

12664* Strain Resistance of Silver-Copper Alloys. The order of magnitude of the resistance to deformation of pure Ag and the effect of Co additions up to the eutectic concentration with 28% C were determined. Electrolytic Ag 99.99% pure and electrolytic Cu were used; 20 mm high test specimens were obtained. The strain resistance degrees obtained with increasing charge Δh% were represented as curves depending on the strain resistance σkg/mm² referring to the initial cross section. Average values were obtained. (*In German.*) Der Stauchwiderstand von Silber-Kupfer-Legierungen. ***E. Pelzel.*** *Metall,* v. 14, July 1960, p. 680-681.

12665* Embrittlement of Metals by Hydrogen. Influence of the Crystallographic and Electronic Structure. High-nickel austenitic alloys were embrittled by H. This proves that the structure of an alloy is not an absolute criterion for predicting its susceptibility to H embrittlement. Attempts to apply the theory of fractures developed by Cottrell to the problem of H embrittlement. A possible explanation of the fact that it is only the transition metals which have so far been embrittled by H is given. (*In French.*) La fragilisation des métaux par l'hydrogène. Influence de la structure cristallographique et électronique. ***P. Blanchard and A. R. Troiano.*** *Revue de Métallurgie, Mémoires Scientifiques,* v. 57, no. 6, June 1960, p. 409-422.

12666 Creep of Tantalum Under Cyclic Elevated Temperatures. An initial study was conducted on the effects of cyclic temperature variations of small amplitudes upon the creep properties of Ta. Results show a marked weakening of the material when a temperature variation of a few degrees is applied in a sinusoidal manner at a rate of one cycle per hour. ***Robert L. Hammel and Robert E. Uhrig.*** *U. S. Atomic Energy Commission, IS*-125, Apr. 1960, 63 pp. (UF767 Un3.1isu Contin.)

12667 Heat Capacity of Plutonium Metal Below 420°K. The heat capacity as a function of temperature below 300 K is represented by curves and least-squared equations for specimens of different purities and isotopic contents. Values of the electronic contribution coefficient, the Debye characteristic temperature, and energy density of states are reported, together with entropy and enthalpy up to 298 K and also at 420 K. A figure showing the heat capacity behavior between 355 and

420 K is given. ***T. A. Sandenaw, C. E. Olsen, and R. B. Gibney.*** *U. S. Atomic Energy Commission,* LA-2398, June 9, 1960, 29 pp. (UF767 U3La Contin.)

See also: **12646** (electric resistance heating of steel).

METALS—MECHANICAL WORKING

12668* Response of a Seismically Mounted Machine Tool to a Transient Site Vibration. Expressions are derived for the motions of the frame and the cutting element of a machine tool, which result when a transient displacement occurs at the support on which the machine tool is seismically mounted. The results are obtained for a damped harmonic displacement of the support and a damped mounting, and extended to cover resonance conditions. ***J. Waldersee.*** *Australian Journal of Applied Science,* v. 2, no. 2, June 1960, p. 250-260.

12669* Maintenance and Repair of Soaking Furnaces. Repair of these furnaces can be shortened and considerably improved by maintaining a definite plan of operation, by stabilizing and specializing the groups of bricklayers and other workers, by mechanizing the work, especially the demolition of masonry, chipping of slag, evacuation of waste products and supply of bricks and mortar. Enough space must be provided for fire-resistant material. (*In Czech.*) Údržba a opravy hlubinných pecí. ***Karel Říha.*** *Hutník (Czech),* v. 10, no. 6, June 1960, p. 241-243.

12670* Metallurgical Aspects and Surface Characteristics. Fundamental aspects of the relationship between the metallurgical changes in the work-piece and mechanism of spark erosion are discussed. ***H. Opitz.*** *Metal Treatment and Drop Forging,* v. 27, June 1960, p. 237-250.

12671* Attempts to Improve the Non-Cutting Forming of Rhodium and Iridium by Plating With Platinum. In electric arc furnaces smelted Rh and Ir sinters are hot-rolled into 0.2 mm plates. Discs 0.2 x 55 mm in diameter from these plates are subjected to cupping tests. To produce perfect cups 16 x 33 mm in diameter, with Rh 4 to 5, with Ir up to 17 intermediate annealings are necessary because of the high strain hardening of these metals during cold deformation. A method to counteract cold strain hardening is given. (*In German.*) Versuche zur Verbesserung der spanlosen Verformung von Rhodium und Iridium durch Plattieren mit Platin. ***G. Reinacher.*** *Metall,* v. 14, July 1960, p. 664-668.

12672 Chemical Milling at Work. Chemical milling is basically a process for removing unwanted metal from a part or product by etching it away in a suitable solution. ***Lew B. Stearns.*** *Products Finishing,* v. 24, no. 10, July 1960, p. 72-77.

12673* Defects of Case-Hardened Products. Discusses defects of metallurgical or metal-working origin, errors in preparing the products for case-hardening, those appearing during chemicothermal treatment, and defects due to grinding. (*In Czech.*) Vady cementovaných výrobků. ***Jaroslav Koutský and František Jandoš.*** *Strojírenská Výroba,* v. 8, no. 7, July 1960, p. 333-337.

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

12674* Mechanism of Martensitic Transformation in Iron Alloys. A new, "double shearing" type mechanism is suggested. Uniform shearing arises from an irregular motion in the transformation, that is in the twin crystal between the interfaces of the interphase. The relations of orientation can be determined mainly by two types of irregular motion. On the other hand the planes can depend on the kinematics of the relaxation of the stresses to which the irregularity of the transformation is subjected. From the kinematics mentioned one can derive the sliding plane observed in the martensite of Fe-30% Ni. (*In Portuguese.*) Mecanismo de transformação martensítica em ligas de ferro. ***Michiyasu Doi.*** *ABM (Boletim de Associaçao Brasileira de Metais),* v. 16, no. 60, July 1960, p. 497-518.

12675* Production of High Quality Single Crystals in the Crystal Lattice. Defects in the crystal lattice are due to the seed diffusing, to stresses caused by cooling, to uniform distribution of impurities resulting in interstitial atoms. Remedies suggested are constant improvement of the successive choice of seeds, longitudinal cooling of single crystals, leaving a high amount of Ge to collect the entire excess of impurities, raising the single crystal to a temperature as far as possible from the point of spontaneous nucleation. (*In Portuguese.*) Produção de monocristais de alta perfeição na rêde cristalina. ***Zenonas Stasevskas.*** *ABM (Boletim da Associaçao Brasileira de Metais),* v. 16, no. 60, July 1960, p. 595-616.

12676 The Analysis of the Crystallography of Martensitic Transformations by the Method of Prism Matching. Describes a method of analyzing the crystallographic features of martensitic transformations by considering the matching of triangular prisms formed by lattice lines in the two structures. Illustrates the theory by a detailed application to the martensitic transformation observed in an iron nickel alloy. Compares this method with other equivalent treatments and discusses its advantages and disadvantages. ***B. A. Bilby and F. C. Frank.*** *Acta Metallurgica,* v. 8, Apr. 1960, p. 239-248.

12677* Solubility Diagram of the Four Component Reciprocal System Na_2SiO_3-K_2SiO_3-NaOH-KOH-H_2O. The solubility of the system was tested at 0 C. Within a range of concentration between 33.0 and 45.0 wt.% KOH, $Na_2SiO_3 \cdot 7,1KOH \cdot 16,26H_2O$ is formed. A thermographic and microphotographic study of this precipitate was performed. (*In Russian.*) Diagramma rastvorimosti chetyrekhkomponentnoĭ vzaimnoĭ sistemy Na_2SiO_3-K_2SiO_3-NaOH-KOH-H_2O. ***M. G. Manvelian, G. G. Babaian, E. A. Saiamian, and S. S. Voskanian.*** *Akademiia Nauk Armianskoi SSR, Izvestiia, Seriia Khimicheskikh Nauk,* v. 13, no. 1, 1960, p. 25-30.

12678* Phasic Work Hardening of Austenite. A study of the effects of phase hardening on the kinetics of the martensite transformation, and the microstructure and submicrostructure of the initial and terminal phase in alloys of two types: Fe-Ni-Mn and Fe-Cr-Ni. Thermomagnetic, radiographic and metallographic methods were applied. The variation of the resistance of the internally hardened austenite as a function of temperature of annealing was considered. (*In Russian.*) O iavlenii fazovogo naklepa austenita. ***O. P. Maksimova and E. I. Estrin.*** *Akademiia Nauk SSSR, Doklady,* v. 132, no. 6, June 1960, p. 1303-1306.

12679* Structure Modifications Caused by Phosphorus in Heat Resistant G-AS 12 NGC Alloy. Through microstructural researches it was proved that the addition of about 0.14% red P to the G-AS 12 NGC alloy produces: a sensible increase of the quantity and a refining of primary Si crystals; a decrease of the length and a slight growth of the lamellar crystals of the eutectic Si; a more equal distribution of $NiAl_3$. Such transformations, persisting after remelting the alloy, refine the fracture grain and increase the mechanical properties. (*In Italian.*) Modificazioni strutturali indotte dal fosforo sulla lega termoresistente G-AS 12 NGC. ***E. Di Russo and A. R. Marmai.*** *Alluminio,* v. 29, no. 6, June 1960, p. 291-299.

12680* The Appearance of a Whisker-Like Structure and of Peculiarities During Diffusion Processes of Formation of Iron-Zinc-Alloy Layers on Hot-Galvanizing. The "whisker-like structure" as a deviating form of the deposit of Zn on steel can be avoided by a natural or artificial condensation of the ζ-phase. The formation of the γ-phase on electrolyte iron is favored. The introduction of impurities into the layer of Fe-Zn alloys seems to limit the transfer of Zn during the formation of the deposit. (*In German.*) Auftreten von Bartgefüge und Besonderheiten der Diffusionsvorgänge bei der Bildung der Eisen-Zink-Legierungsschichten beim Feuerverzinken. ***Heinz Bablik, Franz Götzl, and Erika Nell.*** *Archiv für das Eisenhüttenwesen,* v. 31, no. 6, June 1960, p. 331-336.

12681* The Electrolytic Etching of Polyphase Iron-Chromium-Nickel Alloys in Caustic Soda Solution. Discusses significance of the potential on the etching and describes an apparatus for potentiostatic etching. The plotting of current

density and voltage curves on dissolving of single- and polyphase Fe-Cr-Ni alloys in 10 *N* caustic soda solution, etching with oxidation-reduction systems, and electrolytic etching without a potentiostat are discussed. (*In German.*) Die elektrolytische Ätzung mehrphasiger Eisen-Chrom-Nickel-Legierungen in Natronlauge. ***Werner Schaarwächter, Hans Lüdering, and Friedrich Karl Neumann.*** *Archiv für das Eisenhüttenwesen*, v. 31, no. 6, June 1960, p. 385-391.

12682* The Polygonization of High Purity Copper Revealed by the Micrographic Method. Preferential S diffusion along the sub-boundaries created by preliminary cold-hammering followed by high temperature annealing was used in applying this method. It revealed that pure electrolytic Cu can show a polygonized structure. (*In French.*) Mise en évidence par micrographie de la polygonisation du cuivre de haute pureté. ***Françoise Bourelier and Jean Montuelle.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 250, no. 26, June 27, 1960, p. 4355-4357.

12683* Study of the Etching of a Silver Single Crystal by Means of Low Energy Argon Ions. By varying the relative orientation of a crystal and of a beam of argon ions accelerated under 8kV, modifications of the selective etching process are observed. Necessary conditions for revealing a crystalline plane by ionic etching are given. (*In French.*) Étude de l'attaque d'un monocristal d'argent par des ions argon de faible énergie. ***Pierre Haymann.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 251, no. 1, July 4, 1960, p. 85-87.

12684* A Study of the Conditions of Precipitation of Slight Iron Traces in Aluminum. Simple prolonged annealing, even in the case of high Fe contents, does not produce the complete precipitation obtained by strain hardening. A series of low strain hardening processes alternated by annealings at rather low temperatures must produce the low electric resistance value which characterizes the precipitation of insoluble impurities. (*In French.*) Étude des conditions de précipitation de faibles traces de fer dans l'aluminium. ***Frédéric Montariol.*** *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 251, no. 2, July 11, 1960, p. 240-242.

12685 Thermodynamic Properties of the Aluminum-Silver System. An electrode potential study of the liquid Al-Ag system was conducted with the cell Al(1) | Al^{+++} (in KCl+NaCl) | Al in Ag(1) in the temperature range 700-980 C. The activity curves are found to be similar in shape to those estimated by Chou and Elliott, but they are more ideal in the vicinity of pure Al. ***Thomas C. Wilder and John F. Elliott.*** *Electrochemical Society, Journal*, v. 107, July 1960, p. 628-635.

12686* Determination of the Number of Independent Parameters of Remote and Close Order in Multiconstituent Solid Solutions. In determining the degree of remote order, the distribution of the atoms in equivalent and unequivalent bundles is taken into account, and in determining the close order, not only the distance, but also the arrangement of the atoms in the intermediate spheres are considered. A method to find the number of the independent parameters of the close order in calculating the neighbors of the second order is given. (*In Russian.*) Opredelenie chisla nezavisimykh parametrov dal'nego i blizhnego poriadka v mnogokomponentnykh tverdykh rastvorakh. ***A. N. Men'.*** *Fizika Metallov i Metallovedenie*, v. 9, no. 6, June 1960, p. 801-809.

12687* Radiographic Investigation of the Surface of Iron and Steel After Diffusion Chromizing by the Powder Method. In the marginal zones of Fe, chromium nitride was observed in addition to a solid phase. In the case of steel, carbonitride appears with the carbide phase. The formation of phases containing N is explained by its diffusion from the powder mixture containing ammonium chloride in the steel chromizing process. (*In Russian.*) Rentgenograficheskoe issledovanie poverkhnosti zheleza i stali posle diffuzionnogo khromirovaniia metodom poroshkov. ***N. V. Kariakina and G. N. Dubinin.*** *Fizika Metallov i Metallovedenie*, v. 9, no. 6, June 1960, p. 832-841.

12688 Improvement of the Age-Hardening Properties of Magnesium—Rare-Earth Alloys by Addition of Silver. Shows that the response of Mg–rare-earth alloys to age hardening is markedly improved by the addition of 2-3% Ag. Mechanical properties depend on the particular rare-earth mixture used and improve in the order: mischmetall, mischmetall + Th, Nd (i.e., a mixture of the didymium type containing a greater proportion of Nd and a smaller proportion of less favorable rare-earth metals than does didymium). Zirconium is an indispensable constituent of cast and wrought alloys. The work indicates the suitability of two Mg-Ag-Nd-Zr alloys for castings: these alloys, now known as "MSR-A" and "MSR-B", show proof stresses up to 13 tons/in^2. ***R. J. M. Payne and N. Bailey.*** *Institute of Metals, Journal*, v. 88, pt. 10, June 1960, p. 417-427.

12689 Diffusion of Aluminium, Tin, Vanadium, Molybdenum, and Manganese in Titanium. The influence of temperature and concentration on the diffusivity of substitutional elements in β-Ti was assessed. The diffusivity of Sn and Al in α-Ti at one and two temperatures, respectively, was also determined. Movement of thoria markers at the interface between Ti and titanium alloys during diffusion at a single temperature in the β phase was measured, and from the results partial diffusivities of the alloying elements were calculated by the method of Darken. ***D. Goold.*** *Institute of Metals, Journal*, v. 88, pt. 10, June 1960, p. 444-448.

12690 A Magnetite Seam at the Scale/Metal Interface on Mild Steel. The presence of magnetite at the scale/metal interface has been reported elsewhere in adherent scales. Similar structures are illustrated and the possible mechanisms of formation of a higher oxide in an area of relatively low O concentration are considered. The magnetite seam may be relevant to the behavior of the oxide layer in pickling and mechanical descaling. ***K. Sachs and G. T. F. Jay.*** *Iron and Steel Institute, Journal*, v. 195, pt. 2, June 1960, p. 180-189.

12691 On the Kinetics and Mechanism of the Precipitation of Lithium From Germanium. Nucleus number densities varying by orders of magnitude were obtained from different crystals. It was found that a preannealing treatment at 900 C was sufficient to increase the nuclei number densities for all crystals and the differences tend to disappear upon the preannealing treatment. Doping with O tended to increase very markedly the number density of nuclei whereas doping with small amounts of Cu decreased the number density of nuclei by about an order of magnitude. ***J. R. Carter, Jr. and R. A. Swalin.*** *Journal of Applied Physics*, v. 31, July 1960, p. 1191-1200.

12692 Growth of Atomically Flat Surfaces on Germanium Dendrites. Presents a theory of the formation of extended flat surfaces on Ge dendrites. It is suggested that part of the liquid-solid interface is a supercooled surface, on which new atomic planes are occasionally nucleated. Thermal limitations on the nucleation and propagation of these monolayers are discussed. When such a growing layer reaches the melt surface it creates a step on the solid. It is proposed that the meniscus momentarily sticks to the corner of this step. ***R. L. Longini, A. I. Bennett, and W. J. Smith.*** *Journal of Applied Physics*, v. 31, July 1960, p. 1204-1207.

12693 The Constitution of Thorium-Zirconium Alloys Containing More Than 15% Zirconium and the Effect of Some Third Elements on the Stability of the Body-Centred-Cubic Phase in These Alloys. The β-phase in alloys prepared from commercial purity Th and from "hafnium-free" Zr or from Zr containing one at.% Hf was found to break down to a $\beta_1 + \beta_2$ solid state miscibility gap which has a maximum at 52.5 at.% Zr and a temperature of 950 ± 10 C. The effect of additions of 2 at.% each of Ce, Hf, In, Ti, and U on the decomposition of the β-field in alloys prepared from Zr containing one at.% Hf was studied. Indium, Ti, and U increase the size of the miscibility gap, In having the least effect and Ti the greatest. Additions of Ce and Hf cause the gap to disappear, a smooth β-decomposition curve with a point of inflection in the composition range 45-55 at.% Zr being obtained. ***J. R. Murray.*** *Journal of the Less-Common Metals*, v. 2, no. 1, Feb. 1960, p. 1-10.

12694 Ordering in CoPt-NiPt Alloys. Effects of ordering in alloys of Co-Ni-Pt were studied as an initial step in the investigation of their possible permanent magnet properties. Six alloys having equal increments of composition were investigated, and the lattice parameter values for both ordered and disordered structures determined. Influence of the measured parameters on the possible production of hard magnetic materials

from these alloys is discussed. ***J. C. Woolley and B. Bates.*** *Journal of the Less-Common Metals*, v. 2, no. 1, Feb. 1960, p. 11-18.

12695 The Equilibrium Diagram of the System Molybdenum-Rhodium. The equilibrium diagram above 1500 C, in the composition range 40-100 at.% Rh, was investigated by a combination of thermal, microscopical and X-ray methods. The system contains an intermediate c.p. hexagonal or ε-phase extending from roughly 45-82 at.% Rh, the freezing point of which rises to a maximum at about 67 at.% Rh. Discusses lattice-spacing relations, and determines the hardness of the alloys. ***E. Anderson and W. Hume-Rothery.*** *Journal of the Less-Common Metals*, v. 2, no. 1, Feb. 1960, p. 19-28.

12696* Some Special Features of the Structure of Zinc Selenide Crystals. Zinc selenide was obtained by synthesizing the elements in evacuated quartz combustion boats at 1380 C. High purity single ZnSe crystals were developed from the gaseous phase in a H current and through X-ray examination revealed a hexagonal structure of the Würtzite type. Growth defects were detected in the ZnSe structure, causing the appearance of local cubic structure of the sphalerite type. (*In Russian.*) Nekotorye osobennosti struktury kristallov selenida tsinka. ***E. Krucheanu and Iu. D. Chistiakov.*** *Kristallografiia*, v. 5, no. 3, 1960, p. 364-368.

12697* On the Structure of Phosphide Eutectic in Cast Iron. A study of the structure of the eutectic in the external zone of molds, not subjected to heating beyond 750 C and of the effects of higher temperatures on the changes in the structure of this eutectic. At high temperature, there is a full or partial solution of the cementite of the ternary eutectic and a partial solution of phosphide. In the extremely heated parts the entire P passes into a hard solution. (*In Russian.*) O strukture fosfidnoĭ evtektiki v chugune. ***Ia. N. Malinochka and N. G. Osada.*** *Liteĭnoe Proizvodstvo*, 1960, no. 7, July, p. 21-24.

12698* Close Arrangement and Close De-Mixing in Mixed Crystals. The detection of the modification of states in different alloys, such as Cu-Au, Au Ni, Al-Ag, Ag-Mn, Al-Zn, etc., especially by means of electrical conductivity, was studied. The effects of thermal treatment and deformation on the resistance and Hall constant of Au-Pd alloys and change of susceptibility of quenched Cu-Mn alloys by artificial aging at 100 C were considered as well as the effects of atomic disorder in the lattice on the close arrangement in solid solutions. (*In German.*) Nahordnung und Nahentmischung in Mischkristallen. ***W. Köster.*** *Metall*, v. 14, July 1960, p. 641-649.

12699* Dislocations in Metals. Theory and Applications. Deformation in metals was studied in tensile and pulling tests and from the point of view of impurities, interaction between flaws and dislocations, and strain hardening. Describes observations of dislocation by the electron microscope. Applies crystal dislocation and related mechanisms to the interpretation of similar phenomena in applied chemistry, geophysics, semiconductor transistors, etc. (*In French.*) Les dislocations dans les métaux. Théorie et applications. ***Andre Roos.*** *Métallurgie et la Construction Mécanique*, v. 92, July 1960, p. 517 + 8 pages.

12700* Boron Contents in Magnesite. The spatic magnesite of the salin-epigenetic type (Hall in Tyrol) contain > 10 g/to B, the spatic magnesite of the western graywacke area (type Fieberbrunn) contain > g/to B, while those of the eastern graywacke area contain < 10 g/to B (type Veitsch). The content of B of the magnesite is lower than that of the siderites. (*In German.*) Borgehalte in Magnesiten. ***M. Brandenstein and E. Schroll.*** *Radex Rundschau*, 1960, no. 3, June, p. 150-158.

12701* Investigation of the Precipitation in the Copper-Rich Copper-Titanium Alloys. During the aging of Cu-Ti alloys containing 0.5-6% Ti, a three-stage sequence of precipitates occurs: pre-precipitation, nucleation of a partially coherent intermediate precipitate, precipitation of the equilibrium phase Cu_3Ti. The evolution was studied by means of X-ray crystallography, by metallographic methods and by observation of the variation of mechanical and physical properties. (*In French.*) Étude de la précipitation dans les alliages binaires Cu-Ti riches en cuivre. ***Charlotte Bückle and Jack Manenc.*** *Revue de Métallurgie, Mémoires Scientifiques*, v. 57, no. 6, June 1960, p. 435-449.

12702* Mechanism of γ-Phase Decomposition in Uranium-Molybdenum and Uranium-Molybdenum-Ruthenium Alloys. In uranium alloys containing 8 to 20 at.% of Mo, the decomposition during anneal of the cubic solid solution bears a perlitic feature; X-ray diffraction analysis shows that lamellae of α-uranium are formed, between which the γ-solid solution enriches slowly at first, then abruptly by ordering. (*In French.*) Mécanisme de la décomposition de la phase γ des alliages uranium-molybdène et uranium-molybdène-ruthénium. ***G. Donzé and G. Cabane.*** *Revue de Métallurgie, Mémoires Scientifiques*, v. 57, no. 6, June 1960, p. 450-458.

12703* Effect of Low Copper and Arsenic Contents on the Transformation Behavior and Strength of a Steel Containing About 0.45% C. Examination of 11 steels containing 0.41-0.47% C, 0.007-0.66% As, 0.008-0.57% Cu as well as of two additional steels containing 0.38% C, 0.043 and 1.33% As, 0.19 and 1.53% Cu. Determination of the behavior in transformation and strength by the aid of time-temperature-transformation diagrams and end quenching test curves. Tensile tests in the conditions as normalized and heat-treated. Notch toughness-temperature curves. Conclusions to be drawn, particularly on the effect of As and Cu on the properties examined. (*In German.*) Einfluss kleiner Kupfer- und Arsengehalte auf das Umwandlungs- und Festigkeitsverhalten eines Stahles mit rd. 0,45% C. ***Adolf Rose and Alfred Krisch.*** *Stahl und Eisen*, v. 80, no. 15, July 21, 1960, p. 1007-1017.

12704 New Methods and Instruments in Metallography. New methods of metallographic examination of metals and their microstructure recently developed for routine laboratory tests including the treatment of samples and the description of the necessary equipment are based on various principles as e.g., phase contrast, reflexing objectives, point analysis, microfractography, thermal microscopy and electronic microscopy. (*In Czech.*) Nová zařízení a metody v metalografii. ***F. Laboněk.*** *Strojírenství*, v. 10, no. 6, June 1960, p. 461-467.

12705* The Structures of the Systems Cobalt-Germanium, Rhodium-Silicon and of Some Other Related Alloys. Structures of some phases from systems being quasihomologous to brass-alloys were invested. Hereby the following structure types were found: CoGe(Ni_8 shy type), Co_5Ge_8 (tetragonal inner centered), Rh_5Si_3(Rh_5Ge_3 type), Rh_2Si_2 + (h, B 8), RhSi(h, B 31), Ir_2Si(Ni_2Si type) and other. The relations to the brass phases are discussed. (*In German.*) Zum Aufbau der Systeme Kobalt-Germanium, Rhodium-Silizium sowie einiger verwandter Legierungen. ***Suraj Bhan and Konrad Schubert.*** *Zeitschrift für Metallkunde*, v. 51, June 1960, p. 327-339.

12706* The Effect of Sulfur on the Eutectic of Lead-Antimony Alloys. The widespread literature values of the eutectic data of Pb-Sb-alloys can be explained by different amounts of impurities. 0.01 wt.% S lowers the eutectic temperature from 251.2 to 249.3 C and increases the eutectic concentration from 11.2 to 11.5% Sb. (*In German.*) Einfluss des Schwefels auf das Eutektikum der Blei-Antimon-Legierungen. ***Karlfried Knolle and Karl Löhberg.*** *Zeitschrift für Metallkunde*, v. 51, June 1960, p. 350-353.

12707* The Structure of the Four Components System Silver-Copper-Cadmium-Tin. IV. Continuing former work, further results are presented about the concentration dependence of the different phase regions in the system Ag-Cu-Cd-Sn by giving five isothermal sections and a three-dimensional representation of the isothermal tetrahedron at 600 C. Thirty-one five-phase equilibria as they were found in this system, are shown. (*In German.*) Über den Aufbau des Vierstoffsystems Silber-Kupfer-Kadmium-Zinn. IV. ***Erich Gebhardt and Günter Petzow.*** *Zeitschrift für Metallkunde*, v. 51, June 1960, p. 368-375.

12708* The Constitution Diagram Gold-Strontium. Seven intermetallic phases, Au_5Sr, Au_2Sr, α, β, γ, $AuSr_2$ and $AuSr_5$ are found. All alloys show a considerable volume contraction. The phase Au_5Sr crystallizes in the Cu_5Ca structure. The other structures are not yet determined. (*In German.*) Das Zustandsbild Gold-Strontium. ***Monika Feller-Kniepmeier and Theo Heumann.*** *Zeitschrift für Metallkunde*, v. 51, July 1960, p. 404-408.

12709* Effects of Admixtures on the Recrystallization and Recovery of High Purity Copper. The recrystallization of pure and low-alloyed Cu is investigated and compared with Al. The mechanism of the recrystallization with Cu is governed by vacancy diffusion contrary to the mechanism with Al. A mechanical recovery is observed with Cu only when the recrystallization temperature lays above 200 C, i.e., after a weak deformation or by the addition of foreign atoms. (*In German.*) Über die Beeinflussung der Rekristallisation und Erholung von Reinstkupfer durch Beimengungen. ***Winfried Dahl and Joachim Geissler.*** *Zeitschrift für Metallkunde,* v. 51, July 1960, p. 421-432.

See also: **12651** (transformation of carbides in Cr-Mo steels).

METALS—POWDER

12710 Effect of Dispersion Techniques Upon the Measured Particle Size and Distribution of Tungsten Powder. Presents a study of the comparative de-agglomeration achieved on tungsten metal powders by a group of particle-size techniques used in the refractory powdered metals industry. The results were: fully agglomerated size for the hand-shake technique, strong agglomerate size for the carbide blocks and Micromerograph techniques, basic particle size for the 6-min spatulation, and the basic size minus blocked pore-space surface area for the Sub-Sieve-Sizer. ***A. I. Michaels, T. L. Weaver, and R. C. Nelson.*** *ASTM Bulletin,* no. 247, July 1960, p. 74-77.

12711 Segregation in Homogeneous Alloys During Sintering. The vacancy gradient set up by the sharp curvature of the neck between two sintered particles can produce a considerable segregation in a completely homogenized solid solution. This effect was demonstrated by the precipitate in Cu-In and Cu-Ag alloys occurring in the neck cavity at a higher temperature than indicated by the solvus line and at lower one than the solidus temperature. ***G. C. Kuczynski, G. Matsumura, and B. D. Cullity.*** *Acta Metallurgica,* v. 8, Mar. 1960, p. 209-215.

12712* Impact, Thermal Shock and Long-Time Creep Behavior of Al_2O_3 Based Cermets. The absolute strength of Al_2O_3-Cr cermets is lower than that of TiC- and WC-based cermets. When high toughness of the material is not required and when the material with a relatively low weight exhibits a long-time, oxidation and wear condition satisfactory for high temperatures, Al_2O_3-Cr bonding material is used advantageously. (*In German.*) Über das Schlag-, Temperaturwechsel- und Zeitstandverhalten von Cermets auf Al_2O_3-Basis. ***Werner Schatt.*** *Neue Hütte,* v. 5, May 1960, p. 287-295.

12713* Measuring Methods in Powder Metallurgy. Discusses the methods for characterization of very fine powders with respect to particle size and specific surface. The activation of a powder and its surface are studied to show with examples that powders behave differently as a result of their "activity" from the compact material, and powders react more quickly and violently than the same material in the compact state. (*In German.*) Messmethoden in der Pulvermetallurgie. ***Karl Torkar.*** *Staub,* v. 20, Aug. 1960, p. 299-302.

12714 Slip Casting of Nuclear Fuel Elements. An investigation of liquid-phase sintering as a means of achieving solid density in slip cast stainless steel was started. Minus 100 mesh type 316 spherical stainless steel powder was sintered to 98% relative density in 1 to 2 hr at 1225 C, with the liquid phase supplied by 10w/o Nicrobraz powder dispersed in the casting. Because of the high B content of the brazing alloy, a two-phase microstructure resulted which was not influenced by water quenching. ***Gregory J. Comstock, Edward H. Baron, Frances H. Clark, and Edmund B. Wilson.*** *U. S. Atomic Energy Commisison, TID-5629,* Mar. 15, 1960, 11 pp. (UF767 Un9ti Contin.)

12715 Development of a Nickel-Base Material Dispersion-Hardened by Alumina for 1600°F to 2000°F Service. Compression tests for the as-extruded alloys at room temperature and a number of elevated temperatures up to 1800 F were completed. A significant finding is that the compressive yield properties for all alloys and temperatures are superior to comparable tensile yield properties. ***D. H. Feisel.*** *Westinghouse Research Laboratories, Development of a Nickel-Base Material Dispersion-Hardened by Alumina for 1600°F to 2000°F Service, Progress Report No.* 6, Apr. 14, 1960, 9 pp. (TN799.N6 W52d Contin.)

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

12716* Inspection and Quality Control in a Foundry Producing Automobile and Tractor Castings. Describes the functions of inspection and quality control in a foundry producing large quantities of grey-iron automobile castings. The aims of inspection and the methods of applying it are considered. Discusses advantages of a quality-control section. The work of this section includes inspection of foundry operations, improvement of techniques, etc., with a view to releasing foundry supervisory staff to concentrate on production problems. ***J. W. Deaton.*** *British Foundryman,* v. 53, July 1960, p. 325-329.

12717* Practical Aspects of the Control of Quality of Aluminium-Alloy Sand Castings. Attention is directed to defects likely to be encountered, along with practical illustrations, and steps taken to remedy them. Molding sands, metal/mold reaction, mold coatings, gating, chilling, and risering are considered, and the importance of careful pouring is stressed. Information on molding sands, metal treatment, and defects is outlined in tables, and inspection aspects are treated briefly. ***D. B. McNair.*** *British Foundryman,* v. 53, July 1960, p. 334-341.

12718* Detecting Vacuum Leaks by Emission of Positive Ions. Describes an experimental meter for measuring ion-current variations. Presents characteristics of the detector diode, detector sensitivity determination by constant leaks, preparation and calibration of such leaks, and experiments show that the sensitivity to methyl chloride is 10 times lower than to Freon 12. (*In Slovenian.*) Odkrivanje vakuumskih netesnosti z emisijo pozitivnih ionov. ***Francè Lah.*** *Elektrotehniški Vestnik,* v. 27, no. 11-12, Nov.-Dec. 1959, p. 415-416.

12719* The Scope of Flaw Detection. Nondestructive flaw testing techniques have developed from the radiograph to embrace fluoroscopy, now available as a practical industrial technique, and ultrasonic testing which lends itself, in particular, to fully automatic operation if necessary. Magnetic particle testing, however, still retains its place and all four methods are evaluated. *Mechanical World and Engineering Record,* v. 140, July 1960, p. 288-290.

12720* Radiographic Investigation of Welds as Quality Control. Factors influencing the radiographic examination, such as type and density of material, type of film, time of exposure, dimensions of weld in pipes or plates, welding method, source of radiation, etc., and factors influencing the image formation, such as reproduction capacity and type of radiation were studied together with the film contrast and object contrast. (*In Dutch.*) Radiografisch onderzoek van lassen als kwaliteitscontrole. ***G. J. Janssen.*** *Metalen,* v. 15, no. 9, May 16, 1960, p. 144-149.

12721 An Instrumental Method for Inspection of Rocket Motors. Conventional radiographic methods of inspection of the grid assembly in some small artillery-type rocket motors require expensive and elaborate facilities. Describes an instrumental method in which the variations in the intensities of three γ-ray beams passed through a rotating rocket are measured by three G-M counters and recorded on a short strip of chart paper. These records show immediately whether or not the grid is correctly fitted. ***R. G. Ackland and J. W. Allison.*** *Nondestructive Testing,* v. 18, no. 4, July-Aug. 1960, p. 250-254.

12722 Proceedings of the First National Symposium on Nondestructive Testing of Aircraft and Missile Components. Discusses high energy radiography in the aircraft and missile industries, progress report on the technological advances in thermographic inspection of brazed honeycomb, analysis of focused ultrasonic test techniques, detection of particles in

liquids by the use of ultrasonics, nondestructive testing applications of radiofrequency spectroscopy, and other problems. ***Gordon Taylor, et al.*** Individually paged. 1960. The Society for Nondestructive Testing, Inc., San Antonio. (TL671.7 N21p)

12723* The Use of Radioactive Tracing Methods in the Study of the Processes of Steel Production. A study covering: agitation of bath in open-hearth furnace, determination of volumes of slag and metal, following up slag; tapping, behavior of steel in ladle; experiments with the Ruhrstahl-Heraeus process of degassing steel; top-pouring, tundish when casting large ingots, nonmetallic inclusions in top-pouring; steel jet tracing; flow within mold; tracing of nonmetallic inclusions; slabs; distribution of nonmetallic constituents of the pouring jet among individual ingots of a group. (*In German.*) Radioaktive Markierungstechnik zur Untersuchung von metallurgischen Vorgängen im Stahlwerk. ***Georg H. Pröpstl.*** *Stahl und Eisen*, v. 80, no. 13, June 23, 1960, p. 863-877.

12724 Use of Radioactive Iodine Vapor for Determining Surface Roughness. Several relative roughness factors of Au, brass, and Al surfaces, exhibiting varying degrees of surface roughness, have been determined by utilizing I^{131} vapor as an adsorbate. Polished Au foil processing a high degree of purity, was used as a reference surface. A roughness factor of one was chosen arbitrarily for this reference surface, and all roughness factors contained herein are relative to this value. Figures and illustration describing the experimental equipment are given. ***M. K. Testerman.*** *U. S. Air Force, Wright Air Development Division, WADD Technical Report* 59-659, Dec. 1959, 42 pp. (TL507 Un3.18w Vis.)

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

12725* A Contribution to the Problem of the Neutralization of Rapid Positive Ions on a Metal Surface. Proposes a method for the determination of the integral value of the coefficient of neutralization of positive ions bombarding targets, with the double modulation method. Results are connected with the neutralization of beams of positive ions of Na^+, K^+, Rb^+, and Cs^+ on the surface of W, Mo, and Ta targets depending on the temperature of these targets and on the energy of the bombarding ions. (*In Russian.*) K voprosu o neĭtralizatsii bystrykh polozhitel'nykh ionov na poverkhnosti metalla. ***U. A. Arifov and Kh. Kh. Khadzimukhamedov.*** *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia*, v. 24, no. 6, June 1960, p. 705-709.

12726* Theory of Low-Energy Scattering in Field Theory. Anelastic processes are neglected in the unitarity condition of the S matrix, and their effects lumped into arbitrary constants. The method leads to systems of coupled nonlinear integral equations for the lowest angular momentum partial waves of the different reactions described by the same amplitude. These equations coincide, for the problem of pion-pion scattering, with those found by Chew and Mandelstam with a different procedure. Meson-nucleon and nucleon-nucleon scattering are then investigated by means of a model in which all particles are neutral and spinless. ***M. Cini and S. Fubini.*** *Annals of Physics*, v. 10, July 1960, p. 352-389.

12727* Shielding Calculations for Nuclear Reactors. Nuclear radiation involved in reactor shielding and their sources, calculation methods and their basic theories, and the nuclear data of materials which are necessary for the calculations are listed, or referred to in the special bibliography. Calculations can be made using normal desk calculators. (*In German.*) Strahlenschutzberechnungen für Kernreaktoren. ***K.-H. Lindackers.*** *Atomkernenergie*, v. 5, July-Aug. 1960, p. 272-277.

12728* New Developments in Reactor Design and Layout. Describes advantages and disadvantages of surface and underground distribution of nuclear structures and methods used today in building concrete shelters for stationary power reactors; study was made of the application of antiexplosive protective jackets and use of concretes of different compositions for biological protection of the reactors. (*In Russian.*) Novoe v stroitel'nykh skhemakh i konstruktsiiakh iadernykh reaktorov. ***A. N. Komarovskiĭ.*** *Atomnaia Energiia*, v. 8, no. 6, June 1960, p. 505-513.

12729* Diffusion Phenomena and Isotope Effects in the Extraction of Fission-Product Xenon and Krypton From Irradiated U_3O_8. Investigation of the diffusion of fission-product Xe and Kr from irradiated U_3O_8 powder as a function of temperature has revealed isotopic fractionation and also a double-valued activation energy. The apparent fission yields of Xe^{135} and Xe^{133} show abnormal enrichments of up to a factor of 10 which appear to be related to the precursor half-lives of Xe. ***T. J. Kennett and H. G. Thode.*** *Canadian Journal of Physics*, v. 38, July 1960, p. 945-954.

12730* Epithermal Reactor Shows Promise for Competitive Nuclear Power. Critical assembly test unit will start this summer for measuring cross-sections of core materials and other unproved materials. The advanced epithermal Th reactor will have the following advantages: high thermal efficiency from high operating temperatures, low Na pressures, compactness and high power density, and high neutron economy. ***D. T. Eggen.*** *Electrical World*, v. 154, July 25, 1960, p. 52-54.

12731 Gamma Rays Cause Sporadic Mischief. Experiments demonstrate that high dose-rates cause intermittent malfunctions in electronic equipment. *Electronics*, v. 33, no. 30, July 22, 1960, p. 40-41.

12732* The Economical Arrangement of the Second Heat Cycle in Atomic Power Plants. II. The technical-economical comparison shows that by additional superheating, the economy of an atomic power plant with a hydraulic reactor can be considerably improved. The costs of power generation can be reduced by 17-20%. Briquet fuel can be used for the additional heating. At present, atomic heating is too costly. Evidently, at the end of the century both reactors, providing only saturated vapor, will be replaced by more economical types which will offer higher steam parameters. (*In German.*) Die wirtschaftliche Ausbildung des zweiten Wärmekreislaufs in Atomkraftwerken. II. ***H. Steckler.*** *Energietechnik*, v. 10, no. 6, June 1960, p. 248-255.

12733* Space as a Nuclear Laboratory. A large number of projects in high-energy physics, plasma research, cosmology, and magneto-hydrodynamics, in conjunction with space exploration and meteorology, might be adequate justification when it is realized that the same research cannot be performed on Earth. *Engineering*, v. 190, July 15, 1960, p. 87.

12734 Betatron Installed in Swiss Foundry. Installed by Brown Boveri, the Swiss betatron operates at 31 MeV, the radiation which has been found to have almost the maximum possible penetrating power in iron or steel. Describes safety measures. Exposure time for a very thick object can be reduced if two or even three films are exposed simultaneously. ***J. Grindrod.*** *Foundry*, v. 88, Aug. 1960, p. 116 + 1 page.

12735 Radiation Technology for Nonbiological Materials. Selects from the myriad of publications in this field the relatively small number of findings which contribute to radiation technology and imply commercial potential. Concerns those radiation processes which yield end products for which a use, need, or market exists, and costs involved are in the "ball park" for making the same or similar products by nonradiation techniques. ***A. J. Restaino.*** *Industrial and Engineering Chemistry*, v. 52, Aug. 1960, p. 683-687.

12736 Corrosion and Activity Build-Up in a Power Reactor. On inner surfaces of the primary system, the film of corrosion products which the coolant constantly deposits and picks up again gets thicker at a decreasing rate, but its radioactivity builds up at an increasing rate. To prevent this radioactivity build-up, inhibiting redeposition of suspended material from the coolant seems more promising than increasing purification rate. ***C. Richard Bergen and Julius Chupak.*** *Industrial and Engineering Chemistry*, v. 52, Aug. 1960, p. 699-702.

12737 Criticality Factor Two and Multi-Region Reactors. The determination of the criticality factor is reduced to calculating the dominant eigenvalue of the reactor characteristic matrix. Refers to the calculation of k_{eff} dealt with in the perturbation theory and in the theory of coupled reactors, and to the correlation between experimental and theoretical results.

(*In Italian.*) Calcoli di reattività reattori a due e più regioni. ***L. Sani.*** *Italy, Comitato Nazionale per le Ricerche Nucleari, CNC-28,* Mar. 1960, 66 pp. (QC770 It1.2c Contin.)

12738 Thermal Utilization Factor Calculations for Reactor Cells. Calculations and discussions include plane geometry, cylindrical geometry, unit plane cell with N regions and fuel in an intermediate position, unit cylindrical cell with N regions and fuel in an intermediate position, void at the center of a unit cylindrical cell with N regions and a three-region plane system. ***V. C. Boffi and V. G. Molinari.*** *Italy, Comitato Nazionale per le Ricerche Nucleari, CNC-30,* May 1960, 17 pp. (QC770 It1.2c Contin.)

12739 Isotopic Analysis of Heavy Water of the Reactor. Describes sampling of heavy water from the reactor and D_2O content determination by infrared spectrometry with the band at 2.94μ; the accuracy of this method is $\pm 0.003\%$ D_2O. Describes a method of analysis of an unknown sample of heavy water by means of bands at 1.45μ, 1.66μ, and 2.00μ, in the near infrared. Gives the techniques for analyses and calibration curves for all ranges. ***S. Sandroni.*** *Italy, Comitato Nazionale per le Ricerche Nucleari, CNI-33,* May 1960, 18 pp. (QC770 It1.2ci Contin.)

12740 Gamma Irradiation of Silicon. I. Levels in *n*-Type Material Containing Oxygen. The resistivity and Hall coefficient of *n*-type Si containing O were measured as a function of temperature before and after a number of successive irradiations in a Co^{60} gamma-ray source. A net acceptor level 0.17 ev below the conduction band resulted from the irradiation. A lowering of the mobility below ~100 K was also a result of the irradiations. In heavily irradiated samples, this lowering of the mobility was much greater than could be explained on the basis of point-charge scattering. ***E. Sonder and L. C. Templeton.*** *Journal of Applied Physics,* v. 31, July 1960, p. 1279-1286.

12741* AGR. The Prototype of New Type N-Stations. The Advanced Gas-Cooled Reactor plant being built at Windscale is the prototype of a series of nuclear stations which the Atomic Energy Authority are confident will produce, in 1970, electricity at a price competitive with that from conventional fueled stations. Basically, it is a direct successor to the Calder Hall and current Magnox type of plant but is designed to produce more heat per ton of U. This will be achieved through the use of ceramic uranium oxide as fuel and either Be or stainless steel as the canning material. *Nuclear Energy,* July 1960, p. 305-307.

12742* UKAEA Windscale. HERO—Complement to AGR. HERO (Hot Experimental Reactor—ZERO energy), having a graphite core and enriched uranium oxide fuel elements similar to AGR is being built to provide a suitable high-temperature reactor in which the physics of the AGR system may be studied. It will also be used to study other graphite moderated core arrangements and among planned investigations is the study of the use of Pu fuel elements. *Nuclear Energy,* July 1960, p. 308.

12743* Fuel Handling and Examination. In order to improve fuel-element design and to establish where and why failures occur in existing designs, it is necessary to examine fuel elements after they have been irradiated. Extensive facilities for such examination are being built at Windscale in conjunction with the AGR project. *Nuclear Energy,* July 1960, p. 309.

12744 BR-3. I. General Description. II. Design Philosophy and Plant Construction. III. Core Design and Testing. I. ***L. Mergan.*** II. ***P. Erkes and G. Tavernier.*** III. ***James A. Kilpatrick.*** *Nuclear Engineering,* v. 5, Aug. 1960, p. 337-352.

12745 Boundary Conditions in Slab Lattices. A surprisingly simple method of approximating boundary conditions near control surfaces in a small power-producing reactor. ***A. Jeffrey.*** *Nuclear Engineering,* v. 5, Aug. 1960, p. 363-365.

12746* Extraction of Protons From the Birmingham 1000-MeV Synchrotron. Describes an electromagnetic deflecting channel for protons. ***G. A. Doran, E. A. Finlay, H. R. Shaylor, and M. M. Winn.*** *Nuclear Instruments and Methods,* v. 7, June 1960, p. 225-236.

12747* The Electromagnetic Isotope Separator in Pretoria. A laboratory separator of the "Scandinavian" type using a 90° magnetic sector field of mean radius 180 cm, a maximum acceleration voltage of 80 kV, an electrostatic lens system with two-directional focussing, and magnetic arc sources with end extraction. Special design features make the instrument suitable for the performance of certain nuclear experiments. Particular attention has been given to ion-beam formation in the separator in order to obtain optimum resolving power and good transmission at high ion currents. ***W. E. Frahn, W. L. Rautenbach, and L. Wählin.*** *Nuclear Instruments and Methods,* v. 7, June 1960, p. 253-268.

12748* Cyclotron Instrumentation for Nuclear Reaction Studies by Magnetic Analysis. Describes an instrumentation for magnetic analysis work at a small cyclotron (7 MeV deuterons, 14 MeV α-particles). The equipment consists of two quadrupole lenses and an analyzing magnet for the preparation of a beam spot on the target and of a magnetic spectrometer for investigation of the reaction particles. ***Bo Sjögren.*** *Nuclear Instruments and Methods,* v. 7, June 1960, p. 274-288.

12749* Low Energy Particle Accelerators for Precision Nuclear Physics Research. The three types of particle accelerators presently available for precision research in the nuclear binding energy range are positive-ion linear accelerators, azimuthally-varying-field cyclotrons, and multistage Van de Graaff accelerators. Reviews state of development of these accelerators and compares their relative advantages and disadvantages on the basis of performance capabilities, approximate costs and availability. ***Fred L. Niemann.*** *Nuclear Instruments and Methods,* v. 7, June 1960, p. 338-349.

12750 Few Group Analysis of D_2O-U^{235} Assemblies. Use of relatively simple prescriptions for obtaining group constants is sufficient to give good values of the reactivity over a wide range of concentrations of U^{235} in D_2O. One prescription attempts to take into account the spatial variation in the nuetron spectrum in reflected systems. ***Charles N. Kelber and Philip Kier.*** *Nuclear Science and Engineering,* v. 8, July 1960, p. 1-11.

12751 The Effect of a Diagonal Control Rod in a Cylindrical Reactor. A thin Cd rod was placed diagonally in a cylinder containing water. Change in time decay constant of the neutron flux was measured. Measurements were performed for various ratios of height to radius of the cylinder. Results were compared with calculations where the effective thickness of the rods was estimated in two different ways and the total effect of the rods was obtained by a weighting procedure. The measured values fell between the two calculated curves. ***T. Nilsson and N. G. Sjöstrand.*** *Nuclear Science and Engineering,* v. 8, July 1960, p. 12-13.

12752 Development Testing of Liquid Metal and Molten Salt Heat Exchangers. In order to investigate the design and fabrication problems inherent in compact, high-performance heat exchangers for aircraft nuclear propulsion applications, extensive development testing was done by the ANP Division of the Oak Ridge National Laboratory on bifluid heat exchangers and on liquid metal radiators. The molten salt used was a Na-Zr-U fluoride mixture. Demonstrated that the compact heat exchanger geometries tested possessed the performance capabilities and mechanical integrity to meet ART design requirements. ***R. E. MacPherson, J. C. Amos, and H. W. Savage.*** *Nuclear Science and Engineering,* v. 8, July 1960, p. 14-20.

12753 Design Precepts for High-Temperature Heat Exchangers. Analysis disclosed that the tube diameter should be as small as possible consistent with limitations imposed by deposits on the tube walls. Test experience demonstrated the practicality of tube diameters from ¼ to ⅜ in. o.d. It was found that thermal stresses imposed the most important single set of fundamental limitations on the heat-exchanger design, and that thermal strain cycling associated with changes from low to high power was the most important failure mechanism. This, coupled with leak tightness requirements, made it essential that a ductile material be employed. ***A. P. Fraas.*** *Nuclear Science and Engineering,* v. 8, July 1960, p. 21-31.

12754 Evaluation of the Performance of Liquid Metal and Molten Salt Heat Exchangers. Heat transfer and pressure drop test data were obtained on liquid metal-to-molten salt heat exchangers and on liquid metal-to-air radiators. Data were cor-

related to permit predictions of the heat transfer and pressure drop performance of heat-exchange equipment to be used on the Aircraft Reactor Test. Test results agreed well with analytical predictions using the Dittus-Boelter and Kaufman-Lubarsky equations, except that in the transition region from laminar to turbulent flow, marked differences were found in the heat transfer coefficients for flow through round tubes and axial flow between tubes. ***M. M. Yarosh.*** *Nuclear Science and Engineering*, v. 8, July 1960, p. 32-43.

12755 The Rice Formulation of Pile Noise. Discusses spectrum and variance of "pile noise" according to the formulation of S. O. Rice. Shows that variance diverges as criticality is approached. A convergent quantity closely related to variance is introduced and observations on this quantity taken with ZPR-IV', a light water-moderated highly enriched source reactor at Argonne. ***Edgar F. Bennett.*** *Nuclear Science and Engineering*, v. 8, July 1960, p. 53-61.

12756 Measurements on the Diffusion Length of Thermal Neutrons in Water From 25 to 296 C. The diffusion length of thermal neutrons was measured in water over the range 25.9 to 295.3 C in the pressure vessel of the KAPL High Temperature Critical Assembly. The diffusion length was determined by fitting an exponential to the data found by activating Mn foils with neutrons from a small Sb-Be source. ***K. S. Rockey and W. Skolnik.*** *Nuclear Science and Engineering*, v. 8, July 1960, p. 62-65.

12757 Evaluation of Low-Energy Cross Section Data for U^{233}. A study was made of available experimental data for the cross section and fission parameters for U^{233}. Data was used to arrive at recommended values of the parameters for 2200 m/sec neutrons. Presents methods used in deriving recommended values and includes brief summaries of the measurements. ***J. E. Evans and R. G. Fluharty.*** *Nuclear Science and Engineering*, v. 8, July 1960, p. 66-82.

12758 Low-Cost Electrons: Three Manufacturers Offer New Accelerators. Accelerator developments offer higher power, lower-cost electron beams. ***Marshall R. Cleland and Kennard H. Morganstern.*** *Nucleonics*, v. 18, Aug. 1960, p. 52-57.

12759 Nuclear Power in Outer Space. Space missions will need power sources in a variety of sizes. Existing radioisotope sources can furnish watts of power; compact reactors now under design will provide megawatts. ***William R. Corliss.*** *Nucleonics*, v. 18, Aug. 1960, p. 58-63.

12760 Experimental Verification of the "Incoherent Scattering" Theory for the Transport of Resonance Radiation. Predictions of the incoherent scattering theory of the transport of resonance radiation developed by Holstein and Biberman are shown to agree with laboratory measurements of the decay constants for the intensity of the Hg 2537 A resonance radiation following a period of optical excitation. The success of the theories based on completely incoherent scattering of resonance radiation points to the desirability of including this feature in the treatment of those astrophysical problems in which the spectral line shape is determined by Doppler broadening or by collision broadening. ***A. V. Phelps and A. O. McCoubrey.*** *Physical Review*, v. 118, 2nd ser., no. 6, June 15, 1960, p. 1561-1565.

12761 Nuclear Spin and Hyperfine Interaction of In^{113m}. Studies the hyperfine structure of the 1.7-hr, 393-kev metastable state of In^{113m} by use of the atomic-beam magnetic-resonance technique. The nuclear spin is found to be ½ and the magnetic dipole moment to be −0.21050 ± 0.00002 nm, subject to a possible hyperfine anomaly. The hyperfine separation in the atomic $P_{\frac{1}{2}}$ state is measured as 781.084 ± 0.010 Mc/sec. ***W. J. Childs and L. S. Goodman.*** *Physical Review*, v. 118, 2nd ser., no. 6, June 15, 1960, p. 1578-1581.

12762 Radiochemical Studies of the (*p,pn*) Reaction in Complex Nuclei in the 80-450-Mev Range. Excitation functions for the (*p,pn*) reaction were determined in the energy range 82 Mev to 426 Mev for the target nuclei F^{19}, Cu^{65}, and Au^{197}. The absolute values are based on the excitation function for the reaction $C^{12}(p,pn)C^{11}$. These excitation functions exhibit a general decrease with energy and the cross sections lie between 122 mb for Au^{197} at 82 Mev and 23 mb for F^{19} at 426 Mev. Presents excitation function for the reaction $Al^{27}(p,3pn)Na^{24}$. ***Herbert P. Yule and Anthony Turkevich.*** *Physical Review*, v. 118, 2nd ser., no. 6, June 15, 1960, p. 1591-1598.

12763 X-Ray Yields From μ-Mesonic Atoms. Suggests that the rapid drop in the yield of mesonic *K* X-rays in the light elements may be associated with the capture of μ mesons into the metastable 2*s* state. Investigates the mechanisms for making transitions from the 2*s* to the 1*s* state, and from various *p* states in the 2*s* state for Li, Be, and B. Finds that the paradoxical reduction of *K* X-rays remains unexplained. ***M. A. Ruderman.*** *Physical Review*, v. 118, 2nd ser., no. 6, June 15, 1960, p. 1632-1641.

12764* Scattering of Thermal Energy Ions in Superfluid Liquid He by Phonons and He^3 Atoms. Experiments show that He^3 atoms in superfluid liquid He^4 act like impurities which constitute additional scattering centers for the ions. Results suggest that a roton is a more effective scattering center for an ion than a He^3 atom, and that the negative ion is likely to be a larger and more massive entity than the positive one. ***Lothar Meyer and F. Reif.*** *Physical Review Letters*, v. 5, no. 1, July 1, 1960, p. 1-3.

12765* Mass Analysis of the Secondary Particles Produced by the 25-Gev Proton Beam of the Cern Proton Synchrotron. The intensity of K^+ mesons could be determined at $p = 2.08$ Gev/c. Results indicate that in 25-Gev proton-nucleus collisions, a large number of deuterons are produced with high momenta and at large angles. Deuterons with transverse momenta up to 1.7 Gev/c were observed. ***V. T. Cocconi, et al.*** *Physical Review Letters*, v. 5, no. 1, July 1, 1960, p. 19-21.

12766* Precise Measurements of the Mean Lives of μ^+ and μ^- Mesons in Carbon. Weighted average of the results gave the mean life of 2.211 ± 0.003 μsec. The mean life for the negative muons was found to be 2.043 ± 0.003 μsec. ***R. A. Reiter, T. A. Romanowski, R. B. Sutton, and B. G. Chidley.*** *Physical Review Letters*, v. 5, no. 1, July 1, 1960, p. 22-23.

12767* Formation of Muonium and Observation of Its Larmor Precession. Designed to search for muonium in pure Ar gas at high pressure. The Ar gas was contained in a stainless steel cylinder at a pressure of 50 atm and was purified by recirculation over Ti sponge heated to 500 C. ***V. W. Hughes, D. W. McColm, K. Ziock, and R. Prepost.*** *Physical Review Letters*, v. 5, no. 2, July 15, 1960, p. 63-68.

12768* The Ionization by Polonium Alpha Particles in Air and the Average Energy to Make an Ion Pair. A determination of *W*, the average energy to produce an ion pair, in dry carbon dioxide-free air was made for α-particles from Po^{210}. The ionization was measured at air pressures of 5 cm of Hg, where conditons are optimum for a minimum loss by ion recombination. The value obtained was 34.96 ± 0.07 ev/ion pair—a result somewhat lower than in earlier determinations. ***William P. Jesse.*** *Radiation Research*, v. 13, no. 1, July 1960, p. 1-17.

12769* Principles of Gamma-Ray Moderation. In the range of energy of isotopes, used at present in practice, the photo-effect, Compton effect, and pair production are the decisive reciprocal processes for the moderation of rays. The Compton effect is decisive for moderation of rays in range of energy of γ-radiation of 1 to 3 MeV. The mass absorption coefficient of different elements in this range is assumed as 0.05 sg. cm/g. (In *German.*) Grundlagen der Gammastrahlenschwächung. ***E. Pohl.*** *Technik*, v. 15, June 1960, p. 413-418.

12770 Apparatus for the Study of Fission-Gas Release From Neutron-Activated Fueled Graphite. Simple apparatus for the study of fission-gas release from neutron-activated fueled graphite was developed. Xenon-133 released from a heated specimen is carried in a He sweep gas to a charcoal trap, where the accumulated activity is monitored continuously by a scintillation detector, ratemeter, and pen recorder. The maximum specimen temperature (2500 F) is achieved in 10 min with an induction heater. All instrumentation is commercially available. ***Harvey S. Rosenberg, Robert Lieberman, Duane N. Sunder-***

man, and Ward S. Diethorn. U. S. Atomic Energy Commission, BMI-1444, June 7, 1960, 8 pp. (UF767 U3b Contin.)

12771* Alpha-Deuteron Model of the Li^6 Nucleus. Under the assumption that nucleons of the Li^6 nucleus predominantly form α-particle and deuteron subsystems, a calculation is carried out of the energy of relative motion of these subsystems and shows that the energy has minimum in the negative value region. Determines the energy of the $O^+, T = 1$ excited state of the Li^6 nucleus. (*In Russian.*) Al'fa-deltronnaia model' iadra Li^6. ***T. I. Kopaleishvili, I. Sh. Vashakidze, V. I. Mamasakhlisov, and G. A. Chilashvili.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki,* v. 38, no. 6, June 1960, p. 1758-1764.

See also: **12667** (heat capacity of Pu); **12714** (slip cast nuclear reactor fuel elements).

OPERATIONS RESEARCH

12772 Just What Is the Job of the Process Engineer? A foremost practitioner gives you working dissection of post that is proving vital in battle for top-efficient operations. He pinpoints 14 areas of responsibility and six areas of liaison. ***R. J. Piette.*** *Food Engineering,* v. 32, July 1960, p. 39 + 3 pages.

12773 Man-Computer Symbiosis. In the anticipated symbiotic partnership, men will set the goals, formulate the hypotheses, determine the criteria, and perform the evaluations. Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking. ***J. C. R. Licklider.*** *IRE Transactions on Human Factors in Electronics,* v. HFE-1, no. 1, Mar. 1960, p. 4-11. (TK1 In6.6h Vis.)

12774 Pattern Recognition and Display Characteristics. The operator's task was to recognize which of four patterns presented simultaneously with a reference pattern belonged to the reference pattern family. Analysis of the display characteristics led to the selection of four physical measures to be used in predicting operator performance. These measures—pattern length, pattern density, and two measures of pattern complexity—correlated highly with response time, were not highly intercorrelated, and were applicable to natural sensor returns. The four measures were found to account for a high degree of the total variance. Regression equations were derived which predict performance from known values of the four measures. ***W. R. Bush, R. B. Kelly, and V. M. Donahue.*** *IRE Transactions on Human Factors in Electronics,* v. HFE-1, no. 1, Mar. 1960, p. 11-21. (TK1 In6.6h Vis.)

12775 Desirable Push-Button Characteristics. Results of studies in a series concerning the characteristics of push-button keysets that people can operate quickly, accurately, and conveniently. ***Richard L. Deininger.*** *IRE Transactions on Human Factors in Electronics,* v. HFE-1, no. 1, Mar. 1960, p. 24-30. (TK1 In6.6h Vis.)

12776 Demand for Executives Eases But the Slowdown May Be Only Temporary. *Iron Age,* v. 186, no. 3, July 21, 1960, p. 93-94.

12777* Solution Methods for Waiting Line Problems. Discusses solution method types, standard formula methods, symbols, index of waiting line formulas, waiting line formulas, use of working curves, and the simulation method. ***John R. Shelton.*** *Journal of Industrial Engineering,* v. 11, no. 4, July-Aug. 1960, p. 293-303.

12778* PACE—A New Industrial Engineering Technique for Management. The Northrop experience has proven conclusively that the installation of the Performance and Cost Evaluation Program resulted in sustained trends of greater group output and effectiveness. These improvement trends were immediately reflected in the fields of cost reduction and schedule position without any sacrifice in the quality level. ***D. N. Petersen.*** *Journal of Industrial Engineering,* v. 11, no. 4, July-Aug. 1960, p. 304-312.

12779 Modern Organization Theory. Symposium of the Foundation for Research on Human Behavior. Discusses concept of the social organization, a behavioral theory of organizational objectives, a logical task as a research tool in organization theory, understanding human behavior in organizations, an interaction approach to the theory of organization, a motivation approach to a modified theory of organization and management and other problems. ***Mason Haire, editor.*** 324 pp. 1959. John Wiley & Sons, New York. (HD31 F82m)

12780* How to Bargain as a Group—the Connecticut Way. Part 3 of Rock Products' Labor Series: the Connecticut plan might well offer the answer to one of the most vexing problems faced today by rock-products operators—how to deal on a reasonably equitable basis with organized labor. *Rock Products,* v. 63, Aug. 1960, p. 110 + 4 pages.

12781* Processing. Discusses the rough layout, tolerance chart, routing sheet, diameter chart, special process sheets, and operation sheets used in production-line planning. ***Harry E. Zimmer and J. E. Epprecht.*** *Tool Engineer,* v. 45, no. 2, Aug. 1960, p. 67-75.

ORE AND MATERIALS BENEFICIATION

12782 Flotation of Uranium Ores From the Elliot Lake Area, Ontario. Reagents used were NaOH and Na_2SiO_3 in a desliming step, and tall oil fatty acid, Acintol FA-1 or FA-2, was used as collector. Average recovery was 92% in about 55% of the weight. ***W. R. Honeywell.*** *Canada, Mines Branch, Technical Bulletin TB* 2, Sept. 1959, 8 pp. (TN26 C16.5tb Contin.)

12783 Air Oxidation Acid Pressure Leach Investigations of Uranium-Bearing Ores From Elliot Lake, Ontario. Uranium extractions of at least 95% were obtained from deposits and ores by the above method using a mechanically agitated autoclave. ***V. F. Harrison and W. A. Gow.*** *Canada Mines Branch, Technical Bulletin TB* 3, Oct. 1959, 25 pp. (TN26 C16.5tb Contin.)

12784 The Recovery of Metal Grade Thorium Concentrate From Uranium Plant Ion Exchange Effluents by Amine Solvent Extraction. Ion exchange waste solutions were treated on a pilot-plant scale for the recovery of Th concentrates by solvent extraction with 5% di-tridecyl amine in kerosene, the extract being stripped with either Na_2CO_3 or NaCl. Recovery of Th from solutions was 95% or better. ***R. Simard.*** *Canada, Mines Branch, Technical Bulletin TB* 13, Feb. 22, 1960, 25 pp. (TN26 C16.5tb Contin.)

12785* Behavior of the Structural Constituents During Selective Size Reduction of Mineral Coals. Selective controlled or noncontrolled grinding with subsequent sifting proves more effective than density separation and flotation. The harder constituents, micrinite and vitrinite separate and precipitate in finer particles. The more plastic exinite is mostly deformed and, after crushing, remains as the coarser component. Reduction occurs not only along the phase boundaries, but in the homogeneous part of the grain. (*In German.*) Das Verhalten der Gefügebestandteile bei der selektiven Zerkleinerung der Steinkohlen. ***Carl Kroger and Erich Bade.*** *Gluckauf; Bergmännische Zeitschrift,* v. 96, no. 14, July 2, 1960, p. 863-871.

12786* Investigations of Lump-Ore Reducibility. The penetration of heat into the ore lump is related to the size of the pieces. The porosity of the ore has a definite effect on reduction, since it facilitates the penetration of the reducing gas to the ore and hastens reduction; the course of the reduction process in crude siderite due to the simultaneous formation of CO_2 during roasting is different from that of an ore free of volatile parts. (*In Polish.*) Badania redukcyjności rud kawałkowych. ***Eugeniusz Mazanek and Władysław Markiewicz.*** *Hutnik,* v. 27, no. 4, Apr. 1960, p. 127-137.

12787* Physico-Chemical Problems of Iron-Ore Magnetic Roasting Processes. A study covering dependence of penetration of Fe_3O_4, γ-Fe_2O_3 and α-Fe_2O_3 on the voltage of the magnetic pole, elasticity of the Fe_2O_3 dissociation, equilibrium between iron oxides and a CO plus CO_2 mixture (system Fe-O-C), or a mixture of H_2 plus H_2O (system Fe-O-H), use of annealing in producing magnetite, or hematite, decomposition of thermal siderite, and characteristics of the industrial equip-

ment used. (*In Polish.*) Zagadnienia fizykochemiczne procesów prażenia magnetyzujacego rud żelaza. ***Jerzy Trau.*** *Hutnik*, v. 27, no. 5, May 1960, p. 188-195.

12788* Underground Gasification of Coal by Air: Interpretation of Physico-Chemical Principles. *K. Dziunikowski. Institute of Fuel, Journal*, v. 33, July 1960, p. 337-343.

12789* Influence of Froth Wetting on the Acceleration of Sheelite and Powellite Ores Flotation. Wetting increases the velocity of flotation and stabilizes the grains of valuable minerals which are attached to the air bubbles. (*In Russian.*) Vliianie orosheniia peny na povyshenie skorosti flotatsii sheelitovoi i povellitovoĭ rud. ***S. F. Kuzkin and I. I. Berlinsky.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia*, 1960, no. 3, p. 30-37.

12790* Alkali Influence on Native Gold Flotability. Investigates the effect of alkalis on the flotability of free gold in pulps, containing various sulfides, and also in nonsulfide ores. The greatest flotability of free Au from mixtures with pyrite and pyrrhotine corresponds to the capacity of absorption of alkalis by these mineral pulps. (*In Russian.*) Deĭstvie shchelocheĭ na flotiruemost' samorodnogo zolota. ***L. N. Plaksin and A. G. Lopatin.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia*, 1960, no. 3, p. 38-44.

12791* Loosening of Material in Jigging. On jigging of material consisting of grains of different specific gravity the weight of 1 cu m of dry granular material of separate layers depends not only on the density of packing of the material but also on the specific gravity of the grain in the one or other layer. (*In Russian.*) Razrykhlemie materiala v protsesse otsodki. ***T. G. Fomenko and I. P. Sorokin.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia*, 1960, no. 3, p. 45-48.

12792* Kinetics of Chloridizing Titanium and Niobium Carbides. Conditions for chloridizing compact samples of titanium and niobium carbides, obtained by hot pressing, which permit determination of the quantitative characteristics of the kinetics of the process at different temperatures. It was found that the compact NbC is chlorinated slower at 800 C than at 600 C. The velocity of chloridizing of TiC increases rapidly with an increase in temperature. (*In Russian.*) Kinetika khlorirovaniia karbidov titana i niobiia. ***G. F. Kirillova, G. A. Meerson, and A. N. Zelikman.*** *Izvestiia Vysshikh Uchebnykh Zavedenĭ, TSvetnaia Metallurgiia*, 1960, no. 3, p. 90-96.

12793* Beneficiation of the Manganese Ores of "Úrkút". By magnetic firing and separation of the Mn sands resulting from washing the Úrkút oxide manganese, about half the combined concentrate corresponding to the washed ore can be obtained. By applying a simple method for the exploitation of the carbonate Mn ore, using waste gas containing N, a Mn oxide with about 50% Mn and free from Fe and P was produced. (*In Hungarian.*) Az úrkúti mangánércek dúsítása. ***Laszló Visnyovszky, Tiborné Holló, and Dezsó Horváth.*** *Kohászati Lapok*, v. 93, no. 6, June 1960, p. 245-249.

12794 Beneficiation of Aggregate by Heavy Media Separation. A brief report on the growth of this interesting and relatively new application of gravity concentration. ***Donald Jenkinson.*** *Mining Engineering*, v. 12, July 1960, p. 672-672A.

12795* Influence of Process Factors on Properties and Mineralogical Composition of Fluxed Sinters. Increase of basicity of the sinter and of Fe content in the sintering mixture, and also further diminution of the constituents in the sintering mixture are of the greatest importance for improvement of metallurgical properties of the product. (*In Russian.*) Vliianie tekhnologicheskikh faktorov na svoistva i mineralogicheskiĭ sostav ofliusovannogo aglomerata. ***D. A. Kissin and V. P. Pevtsov.*** *Stal'*, v. 20, no. 7, July 1960, p. 579-583.

12796* A Shaking Table for Film Flotation of Coarse-Grained Mineral Particles. Describes a specially designed table for film flotation producing a better contact of the mineral parts with the atmosphere and thus intensifying the film flotation of the extracted mineral grains. (*In Russian.*) Sotriasatel'nyĭ stol dlia plenochnoĭ flotatsii krupnozernistykh mineral'nykh chastits. ***V. K. Babak.*** *Tsvetnye Metally*, v. 33, no. 7, July 1960, p. 12-15.

12797* Extraction of Tellurium From Solutions by Means of Zinc Dust Cementation. Optimum conditions for Te cementation are alkalinity of solution 50-100 g/l, temperature about 80 C, duration of the process 30-60 min. Four times the amount of Zn powder for the reduction of a sexivalent Te to the elementary state is sufficient for the extraction desired. (*In Russian.*) Vydelenie tellura iz rastvorov putem tsementatsii ego tainkovoĭ pyl'iu. ***P. P. Tsyb and A. A. Levina.*** *Tsvetnye Metally*, v. 33, no. 7, July 1960, p. 61-65.

12798 Recovery of Uranium From Di(2-Ethylhexyl) Phosphoric Acid (Dapex) Extractant With Ammonium Carbonate. *F. J. Hurst and D. J. Crouse.* *U. S. Atomic Energy Commission, ORNL-2952*, July 14, 1960, 22 pp. (UF767 U3o Contin.)

PHYSICS

12799 Magnetohydrodynamic Cavities. Discusses some features of magnetohydrodynamic cavity formation in qualitative terms. Examination of the dependence of the final steady-state configuration on the initial conditions in two cases reveals incompatibilities which may arise in the physical interpretation of the problem if a proper "model" is not specified. ***Bernard Steginsky.*** *ARS Journal*, v. 30, July 1960, p. 642-643.

12800 Measurement of the Displacement Distribution of an Ultrasonic Vibrator by Means of Multibeam Interferometry. The displacement distribution of the vibrator of the Langevin type was observed by means of multibeam interferometry. The displacement at various portions of the surface was measured as a shift of the contour fringes. Besides the fundamental mode at 84 kc, several modes of vibration were found between 50 and 400 kc. ***Takemaro Sakurai, Reiji Shirahase, and Tarō Anzai.*** *Acoustical Society of America, Journal*, v. 32, July 1960, p. 839-840.

12801* Sources of Sound in Piezoelectric Crystals. Examines the production of sound in piezoelectric crystals from the viewpoint of the inhomogeneous wave equation. Shows that sound is generated by a gradient in the piezoelectric stress and that consequently the free surfaces of a piezoelectric crystal are usually the most effective wave sources. Discusses the excitation of sound at microwave frequencies which is equivalent to the case of rf excitation at low frequencies. ***E. H. Jacobsen.*** *Acoustical Society of America, Journal*, v. 32, Aug. 1960, p. 949-953.

12802* Periodic Shock Waves in Resonating Gas Columns. When an oscillating piston forces the enclosed gas in a Kundt tube to vibrate with a finite amplitude near an acoustic resonance frequency of the gas column, shock waves are generated which travel periodiacllv back and forth in the tube. There is also heating of the gas and a rise in its mean pressure. A theory of the steady state motion of the gas in its "fundamental" mode was devised which includes the dissipative effects of wall friction and heat conduction to the tube walls. The dependence of shock strength, mean temperature, and mean pressure on piston amplitude, tube length, gas viscosity, and heat conductivity predicted by the theory are in good qualitative agreement with the small number of experimental data available at present. ***R. Alfred Saenger and George E. Hudson.*** *Acoustical Soicety of America, Journal*, v. 32, Aug. 1960, p. 961-970.

12803* Axially Symmetric Vibrations of a Thick Cylindrical Shell in an Acoustic Medium. Treats the dynamic behavior of infinitely long thick cylindrical shells surrounded by water. The shell is excited by axially symmetric forces. The solution is formed by coupling the three-dimensional elastic solution with the expression for the fluid pressure in cylindrical coordinates. Presents curves which give the forced vibration amplitude and acoustic pressure in the water as a function of frequency for various modes of vibration of the cylinder. ***Joshua E. Greenspon.*** *Acoustical Soicety of America, Journal*, v. 32, Aug. 1960, p. 1017-1025.

12804* Effects of the Surface of the Adsorbent on the Luminescence of the Uranyl Ion. The surface of the adsorbents in a vacuum dihydrates the adsorbed uranyl ion $(UO_2 \cdot {}^2H_2O)^{2+}$. As a result the luminescence intensity sharply

decreases. The structural spectrum of luminescence during the coordination of the ion by the H_2O and NO_2 molecules is accompanied by the formation of a complex surface compound. In the adsorption state, the uranyl ion is not coordinated by the atoms of the surface. Adsorption results from the change of the proton of the surface hydroxyl groups by a uranyl ion. (*In Russian.*) Vozdeĭstvie poverkhnosti adsorbenta na luminestsentsiiu iona uranila. ***G. I. Kobyshev.*** *Akademiia Nauk SSSR, Izvestiia, Seriia Fizicheskaia,* v. 24, no. 6, June 1960, p. 732-755.

12805* The Relativistic Motion of a Charged Particle in an Inhomogeneous Electromagnetic Field. The guiding center approximation for the relativistic motion of a charged particle in a nonuniform electromagnetic field is treated by a method which exhibits the nonconstancy of the adiabatic invariant. The position of the particle is expressed in terms of variables which represent the gyration and motion of the guiding center, respectively; the equations which govern these variables are derived. The equation for the gyration is solved by an iteration method, and the solution is carried to the second approximation. ***Peter O. Vandervoort.*** *Annals of Physics,* v. 10, July 1960, p. 401-453.

12806* Magneto-Optical Rotation in Very High Fields. Magneto-optical rotation by transmission through or reflection from solids is examined by the classical free electron theory, with the view of taking such a measurement using fields in the megagauss range. In general, the rotation is a markedly nonlinear function of the magnetic field, and in some cases can change in sign as the field increases. For very low fields the rotation varies directly with B, but in the high-field limit the rotation varies inversely with the field. ***Richard Stevenson.*** *Canadian Journal of Physics,* v. 38, July 1960, p. 941-944.

12807 ZnS:Cu, Cl and (Zn, Cd)S:Cu, Cl Electroluminescent Phosphors. Procedures for the preparation of ZnS:Cu, Cl and (Zn,Cd)S:Cu, Cl EL[3] phosphors are based on firing in an atmosphere containing elementary S. Cl-incorporation is controlled by firing in capped silica tubes or in open boats in a current of $N_2+S_2Cl_2$. Dependence of brightness on activator concentration is established on the basis of presumably constant excess Cu as Cu_2S. ***A. Wachtel.*** *Electrochemical Society, Journal,* v. 107, July 1960, p. 602-608.

12808 Gold-Activated (Zn,Cd)S Phosphors. Gold is shown to produce three emission bands in CdS at 640, 800 and 1150 mμ. The long wave band appears only when a coactivator is used while the short wave bands are observed with activation by Au alone. The 1150 mμ band in CdS is shown to correspond to the 530 mμ Au band in ZnS. ***M. Avinor.*** *Electrochemical Society, Journal,* v. 107, July 1960, p. 608-611.

12809 Electromagnetism and Relativity With Particular Reference to Moving Media and Electromagnetic Induction. Discusses the electromagnetic field of bodies in uniform rectilinear motion, electromagnetic induction, relativistic theory of second-order e.m.f.'s in moving circuits, electromagnetic energy and momentum. ***E. G. Cullwick.*** 2nd Ed. 291 pp. 1959. Longmans, Green and Co., New York. (QC671 C89e2)

12810 General Crystallography. A Brief Compendium. Discusses geometric, structural, chemical, and physical crystallography. ***W. F. de Jong.*** 281 pp. 1959. W. H. Freeman and Co., San Francisco. (QD905 J73ctr)

12811 Diffraction of a Narrow Beam of Light by Ultrasonic Waves. A light beam which is much narrower than one ultrasonic wavelength and which passes through the ultrasonic wave is deflected periodically. This causes broadening of an image formed by the light. The effects of the slit limiting the size of the light beam are included in an explanation of this phenomenon for progressive ultrasonic waves. ***K. L. Zankel and E. A. Hiedemann.*** *IRE Transactions on Ultrasonics Engineering,* v. UE-7, no. 2, June 1960, p. 71-75. (TK1 In6.6u Vis.)

12812* Platinum Resistance Thermometers. These versatile sensing elements—for temperature measurement in the range from −200 to +1000 C—are used both for precision work of the highest accuracy and for routine industrial applications. *ISA Journal,* v. 7, Aug. 1960, p. 60-61.

12813* Structure of the Films and Direct Photographic Recording in Field Microscopy. By means of field desorption, information can be obtained about the network of the desorption sites, the network of the sites used in the absence of a field, and the mechanism of the desorption process. Transmission and recording methods must be highly sensitive. Suggests direct recording by impact of ions on a photographic plate in the microscope and describes a special device for this purpose. (*In French.*) Structure des films et enregistrement photographique direct en microscopie de champ. ***J. Adam, A. Benoit, and J. C. P. Mignolet.*** *Journal de Chimie Physique,* v. 57, June 1960, p. 500-506.

12814 Measurement of Elastic Constants of RbBr, RbI, CsBr, and CsI by an Ultrasonic cw Resonance Technique. Describes a technique for measurement of velocity of sound in solids. The end correction due to the presence of the transducer and coupling film can be calculated from consideration of a transmission-line equivalent circuit. An experimental comparison is made of the cw and two pulse techniques over the frequency range 5 to 45 Mc. Application of the cw resonance technique is made to the measurement of the room-temperature adiabatic elastic constants of single crystals of RbBr, RbI, CsBr, and CsI. A tabulation of the important elastic properties of these crystals is presented. ***D. I. Bolef and M. Menes.*** *Journal of Applied Physics,* v. 31, June 1960, p. 1010-1017.

12815 Transport Equation for the Spectral Density of a Multiple-Scattered Electromagnetic Field. The use of a first Born approximation is open to question when the path length is greater than a mean free path in the scattering region. The general theory presented is applied to the case of multiple scattering by dielectric noise. A method of solution is developed for the case of forward scattering. The particular case of a monochromatic plane wave incident of a half space is discussed. ***Dimitri S. Bugnolo.*** *Journal of Applied Physics,* v. 31, July 1960, p. 1176-1182.

12816 Electrostatic Acceleration of Microparticles to Hypervelocities. By electrostatic methods, μ-diam spheres of Fe were accelerated to hypervelocities. Techniques were developed to give single impacts in vacuum of measured incident velocity, mass, and position. ***H. Shelton, C. D. Hendricks, Jr., and R. F. Wuerker.*** *Journal of Applied Physics,* v. 31, July 1960, p. 1243-1246.

12817 Equation of State for Nineteen Metallic Elements From Shock-Wave Measurements to Two Megabars. Plane-wave explosive systems were used to accelerate thin metal plates to high velocities. Shock pressures resulting from the collision of these driver plates with a stationary target plate are approximately three times greater than the original shock pressure in the driver plate. The new experimental data extend the Hugoniot loci into the one- to two-megabar region for 19 metallic elements: Ag, Au, Cd, Co, Cr, Cu, Mo, Ni, Pb, Sn, Th, Ti, Tl, V, W, Zn, Bi, Fe, Sb. ***R. G. McQueen and S. P. Marsh.*** *Journal of Applied Physics,* v. 31, July 1960, p. 1253-1269.

12818 Acceleration, Velocity, Distance, Time. A chart for rapidly estimating velocity, displacement, and time at constant acceleration of powered vehicles or free-falling bodies is given. ***V. F. DeVost.*** *Machine Design,* v. 32, Aug. 4, 1960, p. 151-152.

12819* A Thermodynamic Calculation and the Production of Very High Temperatures. Studies the hypercontracted column of the electric-arc, particularly when the disruptive discharge of a powerful condenser is sent into it; from these experiments new spectroscopic considerations and new indications on the problem of the production of very high temperatures are deduced. (*In Italian.*) Un calcolo termodinamico ed un suggerimento sperimentale nel campo delle alte temperature. ***M. Pierucci.*** *Metallurgia Italiana,* v. 52, June 1960, p. 273-276.

12820* Enquiries and Spectrochemical Techniques. The theoretical fundamental basis which leads to a general treatment of Beer's Law is examined. After assuming that the light source is monochromatic and allowing a certain instrumental error, it is shown how the incidence of the error itself on the concentration measurement can be minimized by working within a determined transmittance or by using a differential technique. (*In Italian.*) Indagini e tecniche spettrofotometriche. ***L. Riccoboni.*** *Metallurgia Italiana,* v. 52, June 1960, p. 289-305.

12821* The Present State of Spectrography With Fluorescence X-Rays. Good results in simple analytic cases can be obtained with "non dispersive" systems which use in opportune ways, combinations of primary excitation frequency with the use of suitable filtering diagrams. A part of the dispersion is obtained by electronic means. (*In Italian.*) Lo stato attuale della spettrometria con raggi X di fluorescenza. ***A. Giavino.*** *Metallurgia Italiana*, v. 52, June 1960, p. 306-314.

12822* Ultrasonics. Silent Sound With Muscle. A comprehensive editorial on ultrasonic applications in industry at the present time. ***Bernard S. Miller.*** *Metalworking*, v. 16, Aug. 1960, p. 5-7.

12823* Contrast Transmission and the Image Evaluation Problem. Discusses with the help of contrast-transmission theory, the relative merits of the ray-theoretic moment of inertia, of the Strehl definition, and of the so-called photographic Strehl definition as quality evaluations of astrographic cameras and of camera lenses producing images with the familiar core-and-halo structure. Also considers the "interferometer quality" assessment of Coleman, et al. Concludes that, when a system with primary spherical aberration forms images with a core-and-halo structure, the image quality near best focus depends critically on the properties of the image core, where diffraction effects may be dominant even when the total wave aberrations are large, and the inference is drawn that in evaluating the performance of a photographic system forming core-and-halo images, the photographic Strehl definition should prove much more satisfactory than either the classical Strehl definition or the ray-theoretic moment of inertia. For the performance evaluation of astrographic cameras, on the other hand, use of the ray-theoretic moment of inertia seems to be a satisfactory practical procedure. ***E. H. Linfoot.*** *Optica Acta*, v. 7, no. 1, Jan. 1960, p. 65-80.

12824 Optical Crystallography, With Particular Reference to the Use and Theory of the Polarizing Microscope. Discusses crystallography, light, optics of optically isotropic substances, the polarizing microscope, calculation and measurement of index of refraction, uniaxial crystals in convergent polarized light, optical accessories, optic sign determination in uniaxial crystals, biaxial crystals—the biaxial indicatrix, biaxial crystals in convergent polarized light, determination of optic sign in biaxial crystals, and other problems. ***Ernest E. Wahlstrom.*** 3rd Ed. 356 pp. 1960. John Wiley & Sons, New York. (QD941 W12o3)

12825 Some Optical Properties of Cadmium Telluride. Some optical properties of CdTe samples having a carrier concentration of the order of 10^{15} cm^{-3} were measured. The index of refraction in the infrared was determined to be 2.61. Values of the absorption coefficient α as a function of frequency were obtained at various temperatures. By plotting $\alpha^{\frac{1}{2}}$ and α^2 against frequency, it was found that at room temperature, the minimum energy for direct transitions is 1.50 eV; that for indirect transitions, it is 1.44 eV. The temperature dependencies between 77 K and 373 K are given by $(1.66 - 5.6 \times 10^{-4}T)$ eV for direct transitions and $(1.56 - 4.1 \times 10^{-4}T)$ eV for indirect transitions. ***P. W. Davis and T. S. Shilliday.*** *Physical Review*, v. 118, 2nd ser., no. 4, May 15, 1960, p. 1020-1022.

12826 Moment of Inertia of Superfluid Many-Fermion Systems. For the superfluid state, it is found that collective excitations effect a marked increase in the superfluid moment at intermediate coupling strengths although the resulting moment is still quite small compared with the rigid value. In contrast to the normal state case, where particle-hole pairs play a major role, this increase is almost entirely due to excitations consisting of particle-pairs or hole-pairs. ***Ronald M. Rockmore.*** *Physical Review*, v. 118, 2nd ser., no. 6, June 15, 1960, p. 1645-1652.

12827 Accurate Measurement of Time. Instead of making the clocks keep in step with the Earth, which turns on its axis once in 86,400 sec and revolves once round the sun in roughly 3×10^7 sec, we now make them keep in step with the atom, which makes roughly 10^{10} vibrations in one sec. This change enables the unit of time to be defined much more accurately and conveniently and also much more quickly in a few minutes instead of a few years. ***Louis Essen.*** *Physics Today*, v. 13, July 1960, p. 26-29.

12828 Electromagnetic Waves. Conference report. In spite of the fact that wave problems have been studied for 200 years, each year brings not only new analytical treatments and new practical applications, but new physical concepts as well. ***V. Twersky.*** *Physics Today*, v. 13, July 1960, p. 30-36.

12829 Principles of Modern Physics. Discusses the theory of relativity, quantum mechanics, the one-dimensional harmonic oscillator, the free particle, the one-electron atom, radiation and radiative transitions, the Pauli principle, atomic shell structure, the periodic system, atomic spectroscopy, molecular binding and molecular spectra, quantum statistics, the band theory of solids, X-rays, basic properties of nuclei, particle scattering, radioactivity, systematics of nuclear stability, and other problems. ***Robert B. Leighton.*** 795 pp. 1959. McGraw-Hill, New York. (QC173 L53p)

12830 Progress in Nuclear Energy. Ser. XI. Plasma Physics and Thermonuclear Research. Selection of papers presented at the Second International Conference on the Peaceful Uses of Atomic Energy held at Geneva. This volume is divided into four parts. The first is a general survey of progress, and includes contributions by leading experts from America, Britain, Germany, and the U.S.S.R. The second part of the book is devoted to Particular Devices, with sections on the stellarator, the magnetic mirror, the plane shock, the pinched discharge experiment, the pinched discharge theoretical. The last two parts are headed "Theoretical Papers and Miscellaneous Devices", and the last-mentioned includes a full subject index and details of all the sessions relating to plasma physics and thermonuclear research. ***C. Longmire, James L. Tuck, and W. B. Thompson, editors.*** v. I. 609 pp. 1959. Pergamon Press, New York. (QC776 P94n)

12831 Correlated Orbitals for the Ground State of Heliumlike Systems. Discusses correlated wave functions for He-like systems, singularities in the wave function and the Hamiltonian, iterative equations for the expansion coefficients. ***C. C. J. Roothaan and A. W. Weiss.*** *Reviews of Modern Physics*, v. 32, no. 2, Apr. 1960, p. 194-205.

12832 Mathematical Problems in the Complete Quantum Predictions of Chemical Phenomena. Discusses the essential technique of solution of many-dimensional wave equations and occurrence of projective reduction analysis, sequence of mathematical stages in variational codetor calculations, relation of the Hartree, Fock, Koopmans and Roothaan methods to the polydetor method, and other problems. ***S. F. Boys and G. B. Cook.*** *Reviews of Modern Physics*, v. 32, no. 2, Apr. 1960, p. 285-295.

12833* A Critical Examination of Principal Methods of Illuminating Spectrographs. Discusses the projection of the source by way of one lens, considering a thin source and a thick source, and the formation of a picture of the source by a system of two lenses. (*In French.*) Étude critique des principaux modes d'éclairage des spectrographes. ***Pierre Boillet.*** *Revue d'Optique Théorique et Instrumentale*, v. 39, no. 4, Apr. 1960, p. 147-166.

12834* A Vacuum Monochromator for Far Ultraviolet. Describes a vacuum ultraviolet normal incidence grating monochromator. The focusing device provides a linear wavelength scale and the resolution is better than 0.5 A in the spectral range of the apparatus, which extends from 500 to 3000 A. (*In French.*) Un monochromateur dans le vide pour l'ultraviolet lointain. ***Jacques Romand and Boris Vodar.*** *Revue d'Optique Théorique et Instrumentale*, v. 39, no. 4, Apr. 1960, p. 167-174.

12835 Thermo-Electricity at Low Temperatures. VIII. Thermo-Electricity of the Alkali Metals Below 2°K. Measurements have now been made of the absolute thermo-electric force, E, of all the alkali metals below 2 K and down to about 0.1 K by means of adiabatic demagnetization techniques. The absolute thermo-electric power, S, is derived with fair accuracy from these results ($S = dE/dT$). The results are compared with theoretical developments, particularly those of Bailyn and Ziman. ***D. K. C. MacDonald, W. B. Pearson, and I. M. Templeton.*** *Royal Society, Proceedings*, v. 256, ser. A, July 5, 1960, p. 334-358 + 1 plate.

12836 Symposium of Plasma Dynamics. Discusses experimental research on high-temperature plasmas, problems of thermonuclear fusion and high-temperature plasmas, gaseous

electronics phenomena, dynamics of electron beams, statistical plasma mechanics, continuum plasma dynamics, flight, solar, planetary, interplanetary and cosmical magnetohydrodynamics. ***Francis H. Clauser, editor, et al.*** 369 pp. 1960. Addison-Wesley Publishing Co., Inc., Reading, Mass. (QC711 Sy68s)

12837* Experimental Investigation of the Behavior in the Elastoplastic-Viscous Field of an Oscillator With a Flexional Returnal Power, Under Resonance Condition Stresses. Makes an analytical interpretation of the experimental phenomena concerning the oscillator in the "quasi-elastic" field. Determines damping due to magnetic interactions; in connection with the oscillations in the elastoplastic viscous field, special solutions were determined; the oscillator was studied as a self-regulating system. (*In Italian.*) Indagine sperimentale sul comportamento in campo elasto - plasto - viscoso di un oscillatore con forza di richiamo flessionale, sollecitato in condizioni di risonanza. ***Ettore Pozzo.*** *Tecnica Italiana*, v. 25, no. 3, Apr.-May 1960, p. 205-221.

12838* The Study on Diffraction Anomaly in Optical System. Diffraction anomalies in optical system are studied by using some simple patterns of pupils (as models). Diffraction anomalies which are already known and those recently found in polarization microscopes are systematized with explanations to make them easily understood. Illustrates some new phenomena. Discusses: general theory of diffraction; diffraction image with a single sinusoidal variation of amplitude; various diffraction anomolies; response function; and the reversed-pulse-shaped rectangular wave form. (*In Japanese.*) ***Hiroyoshi Saito.*** *Tokyo University, Institute of Industrial Science, Reports*, v. 9, no. 3, June 1960, 38 pp.

12839 Problems of Dynamic Theory in Statistical Physics. Contains investigations which refer to the problems of obtaining kinetic equations based on equations of mechanics. Designated for scientists, aspirants, and senior students who are interested in the field of statistical physics. ***N. N. Bogoliubov.*** *U. S. Atomic Energy Commission, AEC-tr-* 3852, Mar. 1960, 113 pp. (UF767 Un3.1ae Contin.)

12840 Observations on Transition Boiling Heat Transfer Phenomena. A study was made of boiling heat transfer from a horizontal tube to a saturated liquid at atmospheric pressure in the nucleate, transition, and film boiling regions. Devotes particular attention to the beginning and end of the transition boiling region. Uses two liquids, Refrigerant 11 (Freon 11) and demineralized water. Determines what changes in the boiling curve can be produced by wide variations in the surface. Studies both metallic and nonmetallic surfaces. An extensive photographic study was made using both "still" and motion pictures which did much to shed light on the complicated phenomena of boiling. ***Bernard J. Stock.*** *U. S. Atomic Energy Commission, ANL-*6175, June 1960, 70 pp. (UF767 Un3.1an Contin.)

12841* Effects of Inhomogeneities on the Ferromagnetic Resonance in Metals. For a ferromagnetic, polycrystalline metal, the effects of the magnetic inhomogeneities and of the magnetic stray field on the width of the resonance curve of the permeability were tested for a high-frequency magnetic alternating field vertical upon a constant field H_0 sufficient for saturation. The stray field originates from the effect of the crystal energy changing from crystallite to crystallite, and from the sources of magnetization on the rough surface. (*In German.*) Einfluss von Inhomogenitäten auf die ferromagnetische Resonanz in Metallen. ***W. Döring and H. Vial.*** *Zeitschrift für Naturforschung*, v. 15a, May-June 1960, p. 434-447.

12842* Skin-Effect and Shock Waves in an Induction Gas Discharge. Investigates a gas discharge induced at a frequency of 300 kc/sec. Under the conditions of the experiment, the shock wave front was found to break away from the current layer. The current distribution in the discharge chamber is determined by the nature of the skin-effect for metallic conductors. (*In Russian.*) Skin-effekt i udarnye volny v induktsionnom gazovom razriade. ***S. E. Grebenshchikov and M. D. Raizer.*** *Zhurnal Eksperimental'noĭ i Teoreticheskoĭ Fiziki*, v. 38, no. 6, June 1960, p. 1665-1667.

See also: **12047** (cryogenics); **12233** (ionization of inert gases).

PLASTICS

12843 Radiation Chemistry of Polydimethylsiloxane. I. Crosslinking and Gas Yields. Electron-irradiation of a linear polydimethylsiloxane oil, $[-Si(CH_3)_2O-]_n$, with a molecular weight of 85,000, was studied in the glass state at −180° and in the fluid state from −40 to +150°. At 25° and a radiation intensity of 13.8 x 10⁶r/min, the crosslinking yield, derived from gel and gas measurements, is $G(c.l.) = 3.0$. ***A. A. Miller.*** *American Chemical Society, Journal*, v. 82, July 20, 1960, p. 3519-3523.

12844 Ionic Polymerization. XV. Further Molecular Terminating Agents in the Cationic Polymerization of Styrene. Three polynuclear aromatic compounds and several of the polymethylbenzenes were examined for their molecular terminating ability in the cationic polymerization of styrene by stannic chloride. The relative reactivities toward electrophilic substitution in this system were found to be: *m*-xylene > *o*-xylene; pentamethylbenzene > mesitylene; anthracene > phenanthrene > naphthalene. ***C. G. Overberger and M. G. Newton.*** *American Chemical Society, Journal*, v. 82, July 20, 1960, p. 3622-3626.

12845* Medium-Density Polythene and Packaging. Test data indicate that intermediate polyethylenes give better performance at the same coating weight, or equivalent performance at lower weight, when compared with low density resins. ***Charles S. Imig and John F. Morris.*** *Applied Plastics*, v. 3, July 1960, p. 36-37.

12846* The Surge in Plastics. Discusses production and imports, product improvement, market growth and price movement of polystyrenes, polyolefins, vinyls/acrylics, cellulosics, phenolic/epoxy, amino plastics, polyesters, and special resins. *Canadian Chemical Processing*, v. 44, July 1960, p. 17 + 8 pages.

12847* Chemical Reactions of Polystyrene. By reaction with I and subsequent substitution of the I by Li, one obtains poly-p-lithium styrene, a substance which is extremely reactive and can be converted into a number of interesting derivatives of polystyrene. Discusses a number of reactions involving polystyrene which can be used for making graft polymers. (*In German.*) Chemische Umsetzungen an Polystyrol. ***Dietrich Braun.*** *Kunststoffe*, v. 50, July 1960, p. 375-380.

12848* Initiation of Emulsion Polymerisation by Gamma-Irradiation. Polymer Grafting in a System of Unlimited Kinetic Chain Length. Lattices of polyvinyl acetate polymerized under the influence of γ-rays were used to initiate the polymerization of methyl methacrylate. Extensive grafting occured. If the conditions of preparation were suitable, discrete fractions of graft copolymer could be isolated. ***P. E. M. Allen, G. M. Burnett, J. M. Downer, and Harry Melville.*** *Makromolekulare Chemie*, v. 38, June 1960, p. 72-84.

12849* The Copolymerization of 2-Methyl-5-Vinylpridine. Investigates bulk copolymerization reactions of 2-methyl-5-vinylpyridine (MVP) with styrene(St), methyl methacrylate-(MMA), methyl acrylate(MA), and acrylonitrile(AN) at 60 C. The copolymer compositions were estimated by means of electrometric titrations in a nonaqueous solvent mixture. ***Takashi Tamikado.*** *Makromolekulare Chemie*, v. 38, June 1960, p. 85-95.

12850* The Formation of Polyethylene Terephthalate by Ester Interchange. I. The Polycondensation Equilibrium. II. The Kinetics of Reversible Melt-Polycondensation. III. The Kinetics of the Redistribution Reaction. A kinetic investigation of uncatalyzed reversible polycondensation in polyethylene terephthalate were made at different temperatures and average DP's. Since immediate and complete removal of ethylene glycol from the melt is impossible, the experiments were carried out in a closed system while the reverse reaction, i.e., glycolysis of polyethylene terephthalate, was fully taken into account. ***G. Challa.*** *Makromolekular Chemie*, v. 38, June 1960, p. 105-146.

12851* Preparation, Properties and Reactions of Polyvinylsulfofluorides. Vinylsulfofluoride was polymerized with azo-bis-isobutyronitrile. The degree of polymerization was up to

390. The molecular-weights were determined by measuring the viscosity of the sodium-salts of polyvinyl sulfonic acids obtained by saponification of polyvinyl sulfofluorides. Polyvinyl sulfofluorides were reacted with ammonia, aliphatic and aromatic amines. Conversions up to 80 mole% were obtained. (*In German.*) Darstellung, Eigenschaften und Umsetzungen von Polyvinylsulfofluoriden. ***Werner Kern, Rolf C. Schulz, and Harro Schlesmann.*** *Makromolekulare Chemie,* v. 39, nos. 1-2, July 1960, p. 1-12.

12852* Concerning the Structure of a Spatially Formed Polycondensate Obtained From 2,4,6-Tri(hydroxymethyl)-phenol. The melting condensation of 2,4,6-tri(hydroxymethyl)-phenol results in a spatially formed polycondensate which contains phenol nuclei bonded by means of dimethylene ether bridges. This can be shown through quantitative estimation of the resulting splitting products of the polycondensation. It can also be followed by the quantitative determination of bromine in the products of hydrolysis of the polycondensate with gaseous HBr. (*In German.*) Über die Struktur eines räumlich gebauten, aus 2.4.6-Tri(hydroxymethyl)-phenol erhaltenen Polykondensates. ***H. Kämmerer, M. Grossmann, and G. Umsonst.*** *Makromolekulare Chemie,* v. 39, nos. 1-2, July 1960, p. 39-51.

12853 Filament Wound Reinforced Plastics: State of the Art. I. What You Can Expect From the Parts. II. How to Evaluate the Materials. III. How Process Variables Affect Performance. I. ***Malcolm W. Riley.*** II. ***J. H. Lieb and E. H. Jaffe.*** III. ***S. A. Miller and J. S. Carter.*** *Materials in Design Engineering,* v. 52, Aug. 1960, p. 127-146.

12854 Resilient Foamed Polystyrene. New plastic cushioning material adds resiliency and a degree of flexibility to the basic advantages of low-cost polystyrene, offering a new approach to protective packaging. ***T. J. Grabowski.*** *Modern Packaging,* v. 33, no. 12, Aug. 1960, p. 119-124.

12855* New Process Applies Polyethylene Solution of Paper. Plastic Papers, Inc., has developed a process for applying polythylene coating on paper board and foil. "Contour Coating", as it is called, consists of dissolving polyethylene in a solvent, then flowing the homogeneous solution over the material to be coated. On removal of the solvent the polyethylene remains as a uniform, continuous film on the backing material. ***William Mullen.*** *Paper Trade Journal,* v. 144, Aug. 8, 1960, p. 35.

12856* Corroded Tank Bottoms Repaired With Plastic. Polyester resin reinforced with glass fiber strong enough to seal sizeable leaks and impervious to corrosion. ***Dick Gavitt.*** *Petroleum Engineer,* v. 32, July 1960, p. D12-D14.

12857* A New Method for the Preparation of Polycondensates. Phase Boundary Polycondensation. The principle and mechanism of polycondensation is explained; unstirred and stirred phase-boundary polycondensation with precipitation or dissolution of the polymer is studied and applications of polyamides are indicated. (*In Dutch.*) Nieuwe bereidingsmethode voor polycondensaten. Fasengrens polycondensatie. ***Lambert Jeurissen.*** *Plastica,* v. 13, no. 7, July 1960, p. 520-523.

12858 The Injection Moulding of Nylon II. Discusses processing and properties of Ralsin. Details are given of injection machine and mold requirements, molding technique, shrinkage and normalization of stress. ***J. G. Hawkins.*** *Plastics (London),* v. 25, July 1960, p. 257 + 4 pages.

12859* Variances in Corrosion Resistance of Different Polyester Resins. Castings and laminates made from bisphenol A, isophthalic, and general-purpose polyester resin were immersed in eight corrosive aqueous solutions for periods ranging from 24 hours to 90 days and changes in physical properties were noted. *Plastics Industry,* v. 18, July 1960, p. 12.

12860* Is a Breakthrough for Plastics in Building Due in the Sixties? Plastics may well achieve a real breakthrough in building during the sixties. Favorable factors which exist include: interest in plastics on the part of the building industry and enormous potential offered by building. The plastics industry will have to exert itself to make it happen. ***Albert G. H. Dietz.*** *Plastics Industry,* v. 18, Aug. 1960, p. 15-20.

12861* 3-Year-Old Monsanto House of the Future Still Points the Way. Summary of tests conducted over a 3-year period on the experimental Monsanto plastic home. *Plastics Industry,* v. 18, Aug. 1960, p. 22-25.

12862* Developing Reinforced Plastics to Withstand Extreme Rough Handling Tests. Technical problems solved by devising novel material and methods which were tested and proved feasible in production practice, namely, molding and assembly of plastic components to very close dimensional tolerances and development of plastic materials which can withstand rough handling to an extent hitherto regarded as unattainable. ***Thomas Harris.*** *Plastics Industry,* v. 18, July 1960, p. 26-31.

12863* Accurate Strain Gage Analysis of Plastics Requires Viscoelastic Data. In using strain gages to evaluate the behavior of plastics under conditions of stress and strain, designers have found that accurate interpretation of strain gage readings is possible only if the readings are related to other factors—notably, time, temperature and environment. *SPE Journal,* v. 16, Aug. 1960, p. 789.

12864* Polymer Decomposition: Thermodynamics, Mechanisms, and Energetics. I. Survey of available information relevant to the mechanisms of decomposition of polymers and their thermal stability. ***Leo A. Wall.*** *SPE Journal,* v. 16, Aug. 1960, p. 810-814.

12865* Non-Lubricated Bearings and Piston Rings of Tetrafluoroethylene. ***Roy B. Fehr, Jr.*** *SPE Journal,* v. 16, Aug. 1960, p. 943-948.

12866* Reinforced Plastics in Missiles and Rockets. Performance of reinforced plastics materials in missiles based on requirements of high temperature, structures, chemicals, ease of fabrication, and other conditions permits its use in many different parts. ***J. J. Mobilia and D. V. Rosato.*** *SPE Journal,* v. 16, Aug. 1960, p. 949-952.

12867* Recent Progress in the Chemistry and Structure of Organic Macromolecules. After briefly comparing the methods of study of macromolecular organic chemistry with the chemistry of silicates and glasses, the new methods of synthetizing branched and linear copolymers, cross-linked polymers and polymers with isotactic high crystallinity are reviewed. Emphasizes the relations between the structure and physical-chemical and mechanical properties of macromolecular compounds. (*In French.*) Récents progrès sur la chimie et la structure des macromolécules organiques. ***G. Champetier.*** *Silicates Industriels,* v. 25, nos. 7-8, July-Aug. 1960, p. 327-334.

12868* The Use of Thermosetting Plastics and Fibrous Materials in Industrial Construction. Thermoplastics are widely used for the equipment of buildings. So far new plastic raw materials with duroplastic properties are not satisfactorily tested in practical use. Raw laminate materials, fiber materials and glass fiber materials are discussed. The named materials are important for the future equipment of housing. (*In German.*) Duroplaste und Faserstoffe im Dienste des industriellen Bauens. ***R. Trautvetter.*** *Technik,* v. 15, June 1960, p. 429-432.

12869 Polymerization of Ethylene Under the Influence of Gamma-Radiation. Rate of polymerization of ethylene under the influence of gamma-radiation, in solutions and in gaseous state, at different concentrations of ethylene and dosage rates, and determinations were made of some characteristics of the polymer depending upon the conditions of the process. ***S. S. Medvedev, A. D. Abkin, and P. M. Khomikovskii.*** *U. S. Atomic Energy Commission, AEC-tr-*3894, Sept. 1959, 21 pp. (UF767 Un3.1ae Contin.)

12870 Effect of Thickness on the Mechanical Properties of Glass-Fabric-Base Plastic Laminates. Results of tension, compression, and flexure tests of 11 laminates fabricated from Scotchply 1002 epoxy resin and reinforced with 181-Volan A glass fabric, and 8 laminates fabricated from DC 2106 silicone resin and reinforced with 181-112 glass fabric. ***Robert L. Youngs.*** *U. S. Forest Products Laboratory Report No.* 1573, May 1960, 30 pp. (TS800 Un3.3r Contin.)

See also: **12025** (polyvinylidene chloride water dispersion); **12054** (plastics solar stills).

POLLUTION AND WASTES

12871* An Evaluation of Factors Affecting the Survival of *Escherichia coli* in Sea Water. I. Experimental Pro-

cedures. II. Salinity, pH, and Nutrients. III. Antibiotics. IV. Bacteriophages. ***A. F. Carlucci and David Pramer.*** *Applied Microbiology*, v. 8, no. 4, July 1960, p. 243-256.

12872* Evaluation of Plastic Trickling Filter Media. At temperatures in the range of 45 to 60 C, a biota was developed on the trickling filter pilot plants which was able to effectively reduce the BOD of the waste. Removals of 196 lb of BOD were obtained at temperatures of 54 C. These results were obtained in a 20 ft tower with a recycle of 0.5:1, and offer many possibilities for treatment of industrial waste at the temperatures frequently resulting from the manufacturing process. ***John T. Egan and McDewain Sandlin.*** *Industrial Wastes*, v. 5, no. 4, Aug. 1960, p. 71-77.

12873* Hydrocarbons as Air Pollutants. Analysis of the specific species that cause problems in specific communities; accurate yardstick for measuring the effect of a given species in a particular locality. ***W. L. Faith.*** *Industrial Wastes*, v. 5, no. 4, Aug. 1960, p. 86-88.

12874* The Oxidation of Pyritic Conglomerates. Reports work on the basic mechanism for the production of acid mine wastes. Presents two reactions; oxidation of FeS_2 by dry air, and reaction of FeS_2 in the presence of O and water. The dry oxidation proceeds to $FeSO_4$ and SO_2. In the presence of moisture, $FeSO_4$ and H_2SO_4 are the end products. ***S. A. Braley.*** *Industrial Wastes*, v. 5, no. 4, Aug. 1960, p. 89-91.

12875* Toxicologic Interactions of Mixtures of Air Pollutants. Review of Recent Redevelopments. ***Herbert E. Stokinger.*** *International Journal of Air Pollution*, v. 2, no. 4, June 1960, p. 313-326.

12876* Photochemical Aerosol Formation in Sulfur Dioxide-Hydrocarbon Systems. ***N. A. Renzetti and George J. Doyle.*** *International Journal of Air Pollution*, v. 2, no. 4, June 1960, p. 327-345.

12877 Proceedings of the Twenty-Second Annual Short Course for Superintendents and Operators of Water and Sewerage Systems, March 18, 19, 20, 1959. *Louisiana State University, Engineering Experiment Station Bulletin No.* 64, 1960, 183 pp. (TA21 L93.72b Vis.)

12878* Formation of Air Pollutants. Discusses load variation, stoker firing, large traveling-grates, vibrating grates, single-retort and multiple-retort underfeed stokers, spreader stokers, pulverized coal firing, and cyclone-burner firing. ***Gregory Gould.*** *Power*, v. 104, Aug. 1960, p. 86-88.

RUBBER AND ELASTOMERS

12879* Derivatives of Jojoba Oil as Plasticizers for Vinyl Polymers and Buna-N Rubber. Ten maleinated jojoba oil derivatives were screened as plasticizers in a standard polyvinyl resin formulation and as softeners for Buna-N rubber. Three of these, the methyl and butyl esters and hydrogenated methyl esters of maleinated jojoba acids, were comparable to the reference standard, DOP, as primary plasticizers for the vinyl resin. Three others were satisfactory only as secondary plasticizers. ***Sara P. Fore, H. P. Pastor, J. P. Hughes, and W. G. Bickford.*** *American Oil Chemists' Society, Journal*, v. 37, Aug. 1960, p. 387-390.

12880* Study of Fatigued Viscose Rayon Tyre Cords. Examination under a microscope of a number of rayon tire cords removed from fatigued tires and test specimens showed that the filament breakage which is associated with cord fatigue perdominates in those regions of a cord which have experienced compressive strains. Discusses observed filament damage in relation to the various hypotheses regarding cord fatigue. ***G. B. Redmond.*** *Institution of the Rubber Industry, Transactions*, v. 36, no. 3, June 1960, p. 71-90.

12881* Action of Diphenylnitrosamine on Natural Rubber in Benzene Solution. Reaction followed by viscosity measurements and found to have first order kinetics with respect to the nitrosamine concentration. Reaction probably proceeds either by hydrogen abstraction from the rubber by the nitrosamine followed by fission of the rubber free radical so formed or by formation of a complex between the rubber and the nitrosamine. ***G. H. Foxley.*** *Institution of the Rubber Industry, Transactions*, v. 36, no. 3, June 1960, p. 123-128.

12882* Investigation of the Mechanism of the Action of Zinc-Containing Accelerators of Rubber Vulcanization. During vulcanization, Zn-mercaptide and Zn-dimethyldithiocarbamate decompose to form mercaptobenzothiazoles, tetramethyluramide disulfide, and other compounds. These take part efficiently in the chain of change reactions of S occurring in vulcanization. The Zn-containing accelerators form intermediate polysulfide complexes, which decompose forming active S fragments and participate in the reactions forming the structure of the molecular chains of rubber. (*In Russian.*) Issledovanie mekhanizma deĭstviia tsinksoderzhashchikh uskoriteleĭ vulkanizatsii kauchuka. ***G. A. Blokh, N. N. Podosinnikov, and I. P. Chereniuk.*** *Izvestiia Vysshikh Uchebnykh Zavedeniĭ, Tekhnologiia, Legkoĭ Promyshlennosti*, 1960, no. 3, p. 50-66.

12883* Polarographic Investigations on Vulcanizates Accelerated With 2-Mercaptobenzothiazole and on Their Reclaims as an Analytical Contribution Providing an Insight Into Vulcanization Reactions. In the methyl alcoholic extracts of compounds and of vulcanizates produced during various curing times and temperatures, 2-mercaptobenzothiazole could be estimated quantitatively in the absence of zinc oxide. With zinc oxide present, zinc benzothiazyl mercaptide is formed during mixing and is also to be determined quantitatively after decompoistion with acetic acid. If the compounds contain zinc oxide and stearic acid in molar ratio, the reaction proceeds via mercaptide to zinc stearate. (*In German.*) Polarographische Untersuchungen an mit 2-Mercaptobenzothiazol beschleunigten Vulkanisaten und deren Regeneraten als analytischer Beitrag zur Klärung des Vulkanisations-Verlaufes. ***Friedrich Mocker.*** *Kautschuk und Gummi*, v. 13, July 1960, p. WT 187-198 WT.

12884* Mechanical Strength of Polyester Moldings in Relation to Curing Rate and Type. Production of glass fiber/polyester laminates by the hand lay-up process, vacuum method, or cold molding, is restricted to cold setting. Maximum mechanical strength can be attained in relation to the catalyst system and curing time. Results of the experiments show that final tempering exerts a considerable influence. ***H. Schirmer.*** *Kunststoffe*, v. 50, July 1960, p. 388-390.

12885* Influence of Structure of Some Properties of Mixtures and Vulcanizates of Filled Elastomers. I. Influence of Specific Surface of Carbon Black Particles. Physical properties of different carbon black-rubber mixtures and vulcanizates of important elastomers manufactured in the same way are studied in regard to the specific surface of the kinds of carbon black used. The dependence determined for types of carbon black of the same structure was expressed by an empirical function. It was found that the influence of carbon black in deformation tests is shown in the first approximation in the same way, independent of the type of elastomer and of the system of vulcanization used. Discusses reasons resulting from this knowledge. (*In German.*) Einfluss der Struktur auf einige Eigenschaften von Mischungen und Vulkanisaten gefüllter Elastomere. I. Einfluss der spezifischen Oberfläche von Russteilchen. ***J. Janáček.*** *Plaste und Kautschuk*, v. 7, June 1960, p. 289-293.

12886* Compounding . . . Diene Rubber . . . and Testing. Development of this rubber into superior tire stocks. Describes best methods of processing and compounding and brings forth certain theoretical aspects of the curing reaction with S. Presents results of a large number of tire tests and explains their relationship to the fundamental laboratory properties of the stocks. ***Ward A. Smith and James M. Willis.*** *Rubber Age*, v. 87, no. 5, Aug. 1960, p. 815-822.

12887* Improved Butyl Rubber Vulcanizates. Compares physical and aging properties of a S donor system to those of an elemental S system. ***C. J. Jankowski, K. W. Powers, and R. L. Zapp.*** *Rubber Age*, v. 87, no. 5, Aug. 1960, p. 833-842.

12888* Current Topics in Rubber-to-Metal Bonding. Cleanliness of metal surfaces, improvements in adhesion testing, trend toward one-coat chemical adhesion systems, and necessity of matching cement and stock for good adhesion, are of major importance. ***Stewart L. Brams.*** *Rubber World*, v. 142, no. 4, July 1960, p. 67-75.

12889* Cold Fatigue in Fleet Tested Tires. Concludes that, in general, cords do not become progressively weaker until failure, but rather fail suddenly; failure is not associated with a degradation of fiber tensile properties; localized bond failure is frequently, if not always, associated with such cord failure. ***W. G. Klein, M. M. Platt, and W. J. Hamburger.*** *Tappi*, v. 43, July 1960, p. 657-665.

12890* Some Factors Affecting the Adhesion of Rubbers to Cord Impregnated With Latex-Protein Compositions. Investigates effect of pH of a latex-protein adhesion strengthening composition on the strength of the cord to rubber bond. Suggests that the behavior of the proteins in the latex-protein impregnations is associated with the amino acid composition of the proteins. The degree of asymmetry of casein and keratein molecules was determined. (*In Russian.*) O nekotorykh faktorakh, vliiaiushchikh na adgesiiu rezin k kordu, propitannomu lateksnobelkovymi sostavami. ***A. A. Berlin, R. V. Uzina, and I. L. Shmurak.*** *Vysokomolekuliarnye Soedineniia*, v. 2, no. 6, June 1960, p. 832-837.

12891* Investigation of Structural Changes in Fibers by Measurements of Their Specific Surface Areas and Their Pore Volumes. Adsorption isotherms were obtained of *n*-hexane on viscose fibers subjected to various treatments, of iso-octane on capron cord, on the maximum disintegrated (by mastication) cord and of water on all these materials. Calculations based on the sorption data allowed the changes in structure undergone by the fibers as the result of various treatments to be evaluated. (*In Russian.*) Issledovanie strukturnykh izmenenīĭ volokon putem opredeleniia ikh udel'noĭ poverkhnosti i ob"ema por. ***V. A. Berestnev, T. V. Gatovskaia, and V. A. Kargin.*** *Vysokomolekuliarnye Soedineniia*, v. 2, no. 6, June 1960, p. 916-925.

SPACE HEATING AND CONDITIONING

12892 An Air-Cooled Absorption Cycle. Newly developed air-cooled absorption cycle being used in 3 and 4½-ton gas-fired air conditioning equipment. Ammonia-water is the refrigerant-absorbent combination. Unusual features of the cycle are the use of a hermetic transfer device to circulate solution and a solution-cooled rectifier piped in parallel with the heat exchanger to improve cycle efficiency. ***R. H. Merrick and R. A. English.*** *ASHRAE Journal*, v. 2, Aug. 1960, p. 39-41.

12893* Heating With Light. Thermal properties of light sources in integrated lighting and air conditioning systems can be utilized to improve over-all lighting design and gain economies in installation and operation. New Georgia Power Co. office building is good typical example. ***Joe B. Browder.*** *Electric Light and Power*, v. 38, no. 15, Aug. 1, 1960, p. 71-73.

12894 Aero-Space Industry Opens New Horizons for Air Conditioning Design. The problems involved in air conditioning aircraft, missiles, and rockets are vastly different from these encountered in the design of conventional systems. Compares these problems and discusses the ground rules on which the designs are based. Traces development of air cycle and vapor cycle systems and tells some of their limitations. ***Robert Berner.*** *Heating, Piping & Air Conditioning*, v. 32, Aug. 1960, p. 128-131.

12895 Brine System Maintains Artificial Weather in Auto Fuel Lab. Automotive fuels and lubricants are being tested today in a new laboratory, featuring a brine coil refrigerating system which can maintain a constant temperature in the test room while a 100 mph road test is being simulated. This test chamber is used to perform tests in solving problems of carburetor icing, cold weather starting, and other wintertime driving headaches. ***Paul London.*** *Heating, Piping & Air Conditioning*, v. 32, Aug. 1960, p. 135-137.

12896 How to Avoid Noise Control Failures. Discusses throttled air valves, speech transmission through ducts, dual duct systems, vibration isolation mountings, isolation of ducts and piping. *Heating, Piping & Air Conditioning*, v. 32, Aug. 1960, p. 141-156.

12897 A Comparison of the Performance of Various Room Heating Units Used in the I=B=R Research Home. Results of tests showed that for all the units tested the fuel consumption, boiler water temperature, flue gas temperature, CO_2 in the flue gas, boiler efficiency, and circulator operating time were independent of the type of room heating unit. The second story was warmer than the first story, and the difference became more pronounced at large indoor-outdoor temperature differences. There was less variation in the room air temperatures at all levels when cast-iron heating units were being used. ***Warren S. Harris and Loren N. Montgomery.*** *Illinois, University, Engineering Experiment Station Circular No. 68*, Feb. 1960, 27 pp. (T1 I6c Vis.)

12898* Periodic Heat Flow Characteristics of Simple Walls and Roofs. Gives, for the simpler types of structure, methods for determining the alternating transmittances and time-lags which are required in the calculation of heat flow under periodically varying conditions. Discusses a simple approximate method, suggested by Mackey and Wright, sufficient to give a broad indication of the heat flow variations. ***E. Dantar.*** *Institution of Heating and Ventilating Engineers*, v. 28, July 1960, p. 136-146.

12899* Air Purification. Discusses air deodorization, sterilization, and ionization. ***R. S. Ash.*** *Institution of Heating and Ventilating Engineers*, v. 28, July 1960, p. 147-149.

12900* Dust Suppression by Sonic and Ultrasonic Waves. When fine dust particles are subjected to sound waves, they tend to agglomerate and form larger particles that are easier to suppress and collect. Discusses factors responsible for this phenomenon, describes certain installations, and suggests a number of possible applications in mining and quarrying. ***S. Bandyopadhyay.*** *Mine & Quarry Engineering*, v. 26, Aug. 1960, p. 344-349.

See also: **12043** (drying by radiant heating).

TEXTILES, FIBERS, LEATHER, AND PAPER

12901* Water Sprays Protect Hardwood Logs From Stain and Decay. ***Paul H. Lane and Theodore C. Scheffer.*** *Forest Products Journal*, v. 10, June 1960, p. 277-282.

12902* Dimensional Stabilization of Wood With Aldehydes & Related Compounds. Investigates 16 aldehydes or related compounds as possible crosslinking reagents for the cellulose in whole wood. Results were negative under conditions used and none of the aldehydes formed stable cross-links. ***J. W. Weaver, J. F. Nielson, and I. S. Goldstein.*** *Forest Products Journal*, v. 10, June 1960, p. 306-310.

12903* Some Mechanical Properties of Wood Fibers in Tension. Load-deformation properties of single fibers of wood were measured by means of an electrical-mechanical system for measuring force and deformation. Data from tests of ten coniferous trees show vast differences between species and often between earlywood and latewood fibers of a single species. ***B. A. Jayne.*** *Forest Products Journal*, v. 10, June 1960, p. 316-322.

12904* Investigation of the Solidity of Artificial Fiber-Based Leather. The relative dispersion of the indices of strength and deformability does not depend on the direction of the tensile force relative to the direction of the fibers, and increases with the change of the cotton content in the composition. (*In Russian.*) Issledovanie prochnosti iskusstvennoĭ kozhi na volokonistoĭ osnove. ***E. S. Umanskiĭ, I. M. Landa, and L. I. Rusakovich.*** *Izvestiia Vysshikh Uchebnykh Zavedeniĭ, Tekhnologiia Legkoĭ Promyshlennosti*, 1960, no. 3, p. 40-49.

12905 The Paper Year Book 1960. Presents basic information about paper and nonpaper products which are commonly distributed through paper merchants, together with listings of manufacturers and manufacturers' data. Presents a résumé of the various military and government specifications concerning packaging papers and paper products. ***Benjamin Marsh, editor.*** 572 pp. 1960. Davidson Publishing Co., Duluth, Minn. (TS1172 P19 Vis.)

12906* An Experimental Investigation of the Problem of Breaking and Tearing of the Wet Web on the Fourdrinier Paper Machine. Theoretical results of both theories (breaking and tearing) agree well with experimental data and best conditions for reduction of breaks lie with high take-off angles. Self-healing breaks occur in the range of take-off between 120 and 140°. ***J. Mardon, C. K. Meadley, J. P. Duchesne, and B. I. Howe.*** *Pulp and Paper Magazine of Canada*, v. 61, July 1960, p. T341-T355.

12907* Black Liquor Evaporation. V. Black Liquor Corrosion of Carbon Steel. The black liquor corrosion of carbon steel in an evaporation plant was studied during ten years under varying conditions. Discernible corrosion was found only at temperatures above 115 C and liquor concentrations above 30%. The corrosion seems to increase with the temperature and to be proportional to the quantity of black liquor dry solids passing the steel surface. The variation of the corrosion along the tube indicates that the attack increases with an increased turbulence of the liquor, that is, with an increased rate of heat transfer. (*In Swedish.*) Svartlutsindunstning. V. Svartlutens korrosion av kostål. ***Emil Venemark.*** *Svensk Papperstidning*, v. 63, no. 12, June 30, 1960, p. 387-394.

12908 Mechanical Pulping Manual. Prepared under the direction of the Mechanical Pulping Committee of the Tappi Pulp Manufacture Division. ***Henry J. Perry, et al.*** *TAPPI Monograph Series No.* 21, 1960, 183 pp. (TS1080 T22tm Vis.)

12909* Effects of Cross-Linkage in Wrinkle-Resistant Cotton Fabrics. The three agents used were dimethylol urea, dimethylol ethyleneurea, and formaldehyde. With all three compounds, maximum crease recovery angles are obtained with a substitution of 0.04-0.05 cross links per anhydroglucose unit. As crease recovery angles increase, the elongation and permanent set caused by an 8-kg tensile load on a 1-in. fabric strip decreases. Permanent set approaches zero near 135° warp crease recovery. ***J. G. Frick, Jr., R. A. Kottes Andrews, and J. David Reid.*** *Textile Research Journal*, v. 30, July 1960, p. 495-504.

12910* Properties of Cotton Containing Radiation-Polymerized Acrylonitrile. There was only a slight decrease in breaking strength, a significant increase in elongation-at-break, and a decrease in stiffness of the fibers. Resistance to acid and to heat degradation of the yarn containing polyacrylonitrile was comparable to that of untreated yarn. A radiation dosage of 0.8 megaroentgen gave a maximum add-on of polymer. ***Jett C. Arthur, Jr. and Robert J. Demint.*** *Textile Research Journal*, v. 30, July 1960, p. 505-509.

WELDING AND JOINING

12911* The Influence of Sampling, of the Kind of Electrode and of the Conditions of Welding on the Content of Hydrogen in the Welding Material. Discusses method of sampling H from the welding material, measurements of the temperature drop on joint weld and built-up welding, welding in a cooled Cu mold with an imbedded metal sheet, degasification of welding beads of pure electrode raw material in high vacuum at 650 C. (*In German.*) Einfluss von Probenahme, Elektrodenart und Schweissbedingungen auf den Wasserstoffgehalt im Schweissgut. ***Herbert Zitter.*** *Archiv für das Eisenhüttenwesen*, v. 31, no. 6, June 1960, p. 359-364.

12912* Some Problems of Welding With Austenitic Aluminum Permanganate Electrodes. Studies processes of reduction of Si and C from the oxides during welding with steel electrodes containing a considerable amount of Al. Decreasing the Si and C content in the molten metal necessarily causes a limitation of the dry residue of liquid glass and marble in the coating of the electrodes. (*In Russian.*) Nekotorye voprosy svarki austenitnymi margantsovoaliuminievymi elektrodami. ***R. A. Kozlov and G. L. Petrov.*** *Avtomaticheskaia Svarka*, v. 13, no. 7, July 1960, p. 33-42.

12913* Effects of the Cooling Velocity on the Structure of Molten Cast Iron. By modifying the cooling velocity in the interval of crystallization, a beading metal with 40 ÷ 51 Rc hardness can be obtained. The amount of fissures in the weld seam increases with the increase of the cooling speed. In multilayer beadings of cast iron, the hardness of the metal of the low layers decreases to 38-40 Rc. (*In Russian.*) Vliianie skorosti okhlazhdeniia na strukturu naplavlennogo chuguna. ***G. V. Ksendzyk.*** *Avtomaticheskaia Svarka*, v. 13, no. 7, July 1960, p. 49-57.

12914* Explain Soviet Electroslag Process to World Welding Experts at IIW. World welding accomplishments were discussed in Liege, Belgium, last month by 700 men from 25 industrial nations at the International Institute of Welding Annual Assembly and Congress. ***H. Thomasson.*** *Canadian Metalworking*, v. 23, July 1960, p. 32-33.

12915 A Practical Technique for Welding Gun Metal. Strong welds with low porosity can be made by using uncoated phosphor bronze electrodes which contain 0.3 to 0.45% P. ***L. A. Depue and W. A. Pennington.*** *Metal Progress*, v. 78, no. 2, Aug. 1960, p. 98-100.

12916 Friction Welding: A Lesson in Economics From Russia. Recognizing the advantages of friction welding—low power consumption, high productivity and adaptability to automatic lines—the Russians have put it to work in tool, tractor, and electrical plants to make such items as cranks, shafts, axles, bolts, and cutting tools. ***Arthur B. Tesmen.*** *Metal Progress*, v. 78, no. 2, Aug. 1960, p. 101-103.

12917* Silver in Hard Solders. Covers the structure and properties of Ag hard solders, wetting and resulting processes, effects of diffusion zones on the mechanical properties of soldered joints, processes occurring in narrow crevices and production of hard solders in large amounts. (*In German.*) Silber in Hartloten. ***J. Schatz.*** *Metall*, v. 14, July 1960, p. 687-690.

12918* Investigations of the Softening Zone Occurring During Steel Welding. This zone is characterized by a coarser grain, an irregular distribution of the structural components, a coarser perlitic structure, an increased period of the α-phase lattice as compared with the basic metal and a zone of thermal influence. The zone forms a part of metal subjected during welding to heating up to temperatures of an intercritical interval A_1 - A_3). (*In Russian.*) Issledovanie zony razuprochneniia voznikaiushcheĭ pri svarke staleĭ. ***S. S. D'iachenko, S. I. German, and Ia. S. Pavliak.*** *Metallovedenie i Termicheskaia Obrabotka Metallov*, 1960, no. 7, July, p. 24-26 + 2 plates.

12919* Welding Aluminum. III. The Metal-Inert-Gas Process. Covers the manual and machine methods of metal-inert-gas (MIG) welding. Discusses all phases of the process, including equipment needed; operational theory; torch manipulation; technique; possible applications, etc. *Modern Metals*, v. 16, no. 6, July 1960, p. 62 + 5 pages.

12920 Designing Brazed Joints for 1000 F and Above. High-temperature brazing efficiently joins stainless steels, alloy steels and the superalloys. Explains how it works, when to specify it, how to select the right materials, and procedure to follow to get design started. ***J. C. Reeves.*** *Product Engineering*, v. 31, no. 31, Aug. 1, 1960, p. 40-45.

12921* Tests for the Definition of Weldability of Steels. Covers influence of the time factor upon the formation of the crystalline structure, "weldability" as a qualitative parameter, advantages of the wedge for judging the crystalline structure of welded joints, and factors influencing martensite formation and their consequences. (*In German.*) Versuche zur Bestimmung der Schweissbarkeit von Stählen. ***Felipe Calvo.*** *Schweissen und Schneiden*, v. 12, July 1960, p. 303-308.

12922* Experimental Study of the Weldability of Some High Strength Steels Used for Aircraft Construction. Deals with a certain number of high strength steels: selection of electrodes and determination of the properties of welded assemblies in the case of 30CD12 and 40NCD8 (AISI 4340) steels; and the search for preheating and postheating conditions guaranteeing the absence of cracking, as determined by the CTS test, during arc welding with coated electrodes of 20CD8, 30CD12, 35CD4 and 40NCD8 steels. (*In French.*) Étude expérimentale de la soudabilité de quelques aciers à haute résistance, utilisés en construction aéronautique. ***H. Granjon and J. Rosenzweig.***

Soudage et Techniques Connexes, v. 14, no. 516, May-June 1960, p. 209-228.

12923* Strength of Aluminum Alloy Joints in Ultrasonic Welding. The static strength of joints made of D16M and AMg3M welded by ultrasonic method, during cutting and shearing and at elevated temperature, does not exceed the strength of joints obtained by contact welding. Increasing the testing temperature to 150 C decreases the strength by 20-25% and to 250 C by 40-45%. The vibrational strength of binding joints welded by ultrasounds is very high and higher by 30% than in the case of contact welding. (*In Russian.*) Prochnost' soedineniĭ aliuminievykh splavov pri ul'trazvukovoĭ svarke. ***L. L. Silin, V. A. Kuznetsov, and M. A. El'iasheva.*** *Svarochnoe Proizvodstvo*, 1960, no. 7, July, p. 5-8.

MISCELLANEOUS

12924* A Certain Class of Topological Properties. Focuses attention on properties which in general lie between the global and local, and which might be termed medial. The property of every open subset of a space being a G_δ is medial, in that it holds for all open sets, large and small. ***R. L. Wilder.*** *American Mathematical Society, Bulletin*, v. 66, no. 4, July 1960, p. 205-239.

12925* Some Theorems and Conjectures in Diophantine Equations. The theory of diophantine equations may be regarded as the natural continuation of algebraic geometry proper: having once obtained a general theory of algebraic equations in several variables over essentially arbitrary ground fields (or rings), one tries to get statements depending on the special arithmetic structure of the coefficient domain. By definition, this becomes diophantine analysis. ***Serge Lang.*** *American Mathematical Society, Bulletin*, v. 66, no. 4, July 1960, p. 240-249.

12926* Diversity of Talent. States the first principles of a strategy of talent development, a strategy that provides a unifying rationale for efforts to improve the construction and interpretation of tests, and the counseling, guidance, and education of talented young minds. The strategy is one of increasing the diversity of talent, in an individual, within an occupation, and in society. The needs of the nation for highly developed talent are growing and will continue to grow. ***Dael Wolfle.*** *American Psychologist*, v. 15, Aug. 1960, p. 535-545.

12927* A Method of Analyzing Log-Normally Distributed Survival Data With Incomplete Follow-Up. A method is presented for analyzing survival data with incomplete follow-up when there is reason to suppose that the data have a translated log-normal distribution. The life table method is used to make allowances for those patients lost to observation and for tabulating the resulting survival frequencies. ***Manning Feinleib.*** *American Statistical Association, Journal*, v. 55, no. 291, Sept. 1960, p. 534-545.

12928* Bibliography on Sequential Analysis. Contains 374 references dealing with the subject of sequential analysis. ***J. Edward Jackson.*** *American Statistical Association, Journal*, v. 55, no. 291, Sept. 1960, p. 561-580.

12929* Generalizations of Wald's Fundamental Identity of Sequential Analysis to Markov Chains. An extension of Bellman's analogue of Wald's identity is proved for Markov processes with a finite number of states, in which the diagonal matrices of the state functions and the transition matrices may be heterogeneous, but are so related that the product of the two matrices which apply at any stage has at least one modal vector in common with all of the corresponding products which apply at other stages, and the probability distribution of the duration of any one realization of the process satisfies certain conditions. ***M. C. K. Tweedie.*** *Cambridge Philosophical Society, Proceedings*, v. 56, pt. 3, July 1960, p. 205-214.

12930 The Causes of Wealth. Discusses level of living—wages and purchasing power in France, general indicators of the level of living, level of living in the world, level of living and productivity of work; style of life—occupational factors, duration of work, education, individual and family factors, health and life expectancy. ***Jean Fourastié.*** 246 pp. 1960. The Free Press of Glencoe, Chicago, Ill.

12931* The Case for Professional Schools of Engineering. Proposes that recognition be given to the need of providing two distinct types of advanced study—one for the research-oriented student within the usual graduate school—the other for the practioner-mined student, to be administered within the engineering school. ***R. E. Fadum.*** *Civil Engineering*, v. 30, Aug. 1960, p. 80-82.

12932 An Introduction to Probability Theory and Its Applications. Discusses the sample space, elements of combinatorial analysis, fluctuations in coin tossing and radom walks, combination of events, conditional probability, stochastic independence, binomial and Poisson distributions, normal approximation to the binomial distribution, unlimited sequences of Bernoulli trials, random variables and other problems. ***William Feller.*** v. I. 2nd Ed. 461 pp. John Wiley & Sons, New York. (QA273 F33i2)

12933* Response Strengthening by Information and Effect in Human Learning. The most interesting result was the unexpected finding that Ss receiving information alone learned significantly better on acquisition trials in both experiments than Ss receiving information plus reward. The original hypothesis that reward would produce a more stable response than equivalent information alone was found to have certain suggestive support. ***W. A. Hillix and Melvin H. Marx.*** *Journal of Experimental Psychology*, v. 60, no. 2, Aug. 1960, p. 97-102.

12934* The Error of Estimate in Systematic Activity Sampling. Presents explicit formulation of sampling error estimation problems in systematic activity sampling. Directs attention to the requirement for observation intervals in excess of activity durations as a condition for strict applicability of binomial distribution theory. ***H. O. Davidson, W. W. Hines, and T. L. Newberry.*** *Journal of Industrial Engineering*, v. 11, no. 4, July-Aug. 1960, p. 290-292.

12935 How To Go About Planning the Engineering Office. Survey existing arrangements, analyze needs, plan new layout, evaluate alternatives, implement plans, adjust new arrangements. ***Robert G. Murdick.*** *Machine Design*, v. 32, Aug. 18, 1960, p. 138-145.

12936* Viewpoints on Safety. V. Responsibility of the Management Staff. Scope of a safety program is directly related to the size of the company, and the responsibility for that program rests squarely with that group known as management staff. ***H. D. Stott.*** *Mining Congress Journal*, v. 46, Aug. 1960, p. 62-64.

12937 Modern Probability Theory and Its Applications. Introduces the student to the concepts and ideas of modern probability theory, shows its applications to real phenomena, and provides a technique for confidently solving probability problems involving both discrete and continuous probability theory. ***Emanuel Parzen.*** 464 pp. 1960. John Wiley & Sons, New York. (QA273 P25m)

12938 Fifteen Years' Experience With a Five-Year Engineering Curriculum. The greatest strength of the five-year curriculum is the fact that adequate time may be devoted to the increasingly important areas of mathematics, basic science, engineering science, and the social-humanistic areas and, at the same time, a significant portion of class time can be available for the analysis and design of engineering systems. ***Marion L. Smith.*** *News in Engineering at Ohio State University*, v. 32, no. 3, July 1960, p. 11 + 6 pages.

12939 Coordinating Industrial Standards With American Standards Practice. Cooperation to the fullest extent possible by American companies in the standardization programs of their industry and in the American standards movement is urgently needed. Without such participation, the formulation of good, practical standards and coordination of standards between industries is painstakingly slow. The cost of inefficiencies resulting from off-breed or conflicting standards continues to mount. ***R. P. Trowbridge.*** *News in Engineering at Ohio State University*, v. 32, no. 3, July 1960, p. 29-32.